ORDER NO. AD8812323C2

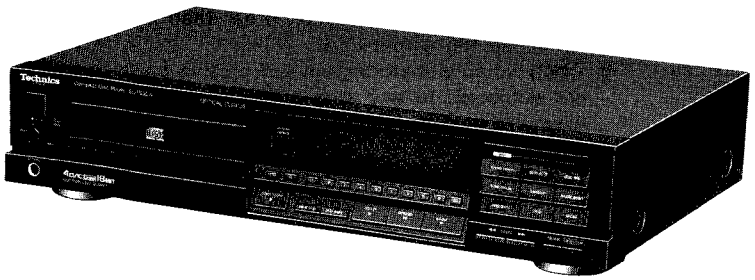
Service Manual

COMPACT disc DIGITAL AUDIO

DIGITAL

Compact Disc Player

SL-P222A



Color

(K)...Black Type
(S)...Silver Type

Area

Country Code	Area	Color
(E)	Continental Europe.	(K) (S)
(EK)	United Kingdom.	(K) (S)
(EG)	F.R. Germany.	(K) (S)
(EB)	Belgium.	(K) (S)
(EH)	Holland.	(K) (S)
(EF)	France.	(K) (S)
(Ei)	Italy.	(K) (S)

SPECIFICATIONS

■ Audio

No. of channels	2 (left and right, stereo)
Frequency response	2–20,000 Hz ± 0.5 dB
Output voltage	2 V (at 0 dB)
Dynamic range	96 dB
S/N ratio	96 dB
Total harmonic distortion	0.005% (1 kHz, 0 dB)
Harmonic distortion	0.003% (1 kHz, 0 dB)
Wow and flutter	Below measurable limit
Output impedance	Approx. 600Ω
Load impedance	More than 10 kΩ
Headphone output level	15 mW max. 32Ω (adjustable)

■ Signal Format

Sampling frequency	44.1 kHz
D-A conversion	16-bit linear

■ Pickup

Wavelength	780 nm

■ General

Power supply	
For United Kingdom:	AC 50/60 Hz, 240V
For others:	AC 50/60 Hz, 220V
Power consumption	13 W
Dimensions (W x H x D)	430 x 92 x 278 mm
Weight	3.6 kg

Specifications subject to change without notice.
Weight and dimensions shown are approximate.

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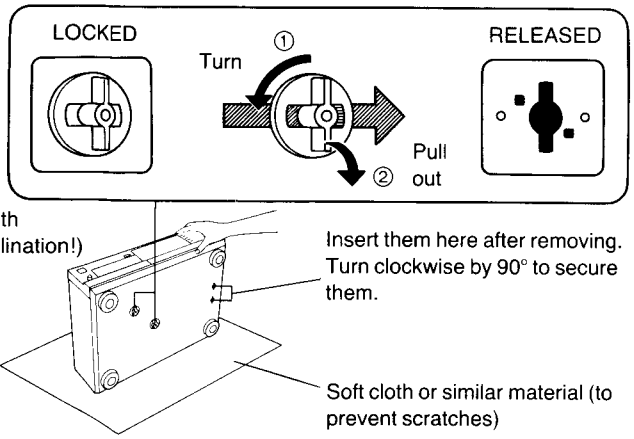
Technics

Matsushita Electric Industrial Co., Ltd.
Central P.O. Box 288, Osaka 530-91, Japan

■ PLACEMENT

Before placement

Two transport security devices are secured to prevent the optical pickup from damage during transport.
Be sure to release them before use.



Note:
When transporting the unit, be sure to remove the compact disc from inside the unit. And replace the transport security devices again following the reverse order not to damage the optical pickup. (Make sure to place the unit with the rear panel facing downward.)

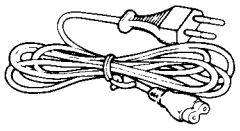
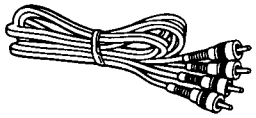
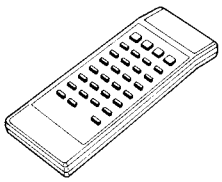
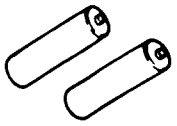
Notes of placement

■ **Place on a flat, level surface so that the front-rear inclination does not exceed 5°.**
■ **Avoid places such as the following:**
- Near any equipment or device that generates strong magnetism.
- On any heat-generating equipment or device, or in any place where the temperature is high (40°C or higher).
- Extremely cold places (5°C or below).
- Near a tuner or TV (It may cause noise in the broadcast, or disturbance of the TV picture.)

■ **Do not place heavy objects, other than system components, on top of the unit.**
■ **When carrying or storing the unit, handle it with care so it is not subjected to any strong bumps.**
Always remove the disc before storing the unit for any period of time.
■ **To avoid problems due to vibration.**
- Do not place a book or similar object under this unit.
- Do not route the connection cables (of this or other units) across the operation panel, across the top, or under the unit.

■ ACCESSORIES

•AC power supply cord .. 1 SJA187 (E, EG, EB, EH, EF, Ei) SJA193 (EK)	•Stereo connection cable 1 (SJP2249-3)	•Remote control transmitter ..... 1 (EUR64766) .... Black type (EUR64767) .... Silver type	•Batteries 2 (UM-4NE/2S)

Note: Configuration of AC power supply cord differs according to area.

■ PRECAUTION OF LASER DIODE

CAUTION: This product utilizes a laser diode with the unit turned "on", invisible laser radiation is emitted from the pick up lens.
Wave length: 780nM
Maximum output radiation power from pick up: 100μW/VDE

Laser radiation from the pick up lens is safety level, but be sure the followings:

1. Do not disassemble the optical pick up unit, since radiation from exposed laserd diode is dangerous.
2. Do not adjust the variable resistor on the pickup unit. It was already adjusted.
3. Do not look at the focus lens using optical instruments.
4. Recommend not to look at pick up lens for a long time.

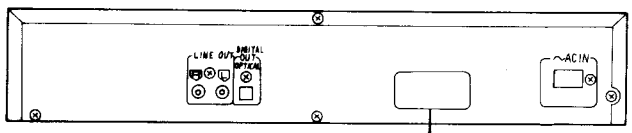
ACHTUNG: Dieses produkt enthält eine laserdiode. Im eingeschalteten zustand wird unsichtbare laserstrahlung von der lasereinheit abgestrahlt.

Wellenlänge: 780nM
Maximale strahlungsleistung der lasereinheit: 100μW/VDE

Die strahlung an der lasereinheit ist ungefährlich, wenn folgende punkte beachtet werden:

1. Die lasereinheit nicht zerlegen, da die strahlung an der freigelegten laserdiode gefährliich ist.
2. Den werksseitig justierten einstellregler der lasereinreit nicht verstellen.
3. Nicht mit optischen instrumenten in die fokussierlinse blicken.
4. Nicht über längere zeit in die fokussierlinse blicken.

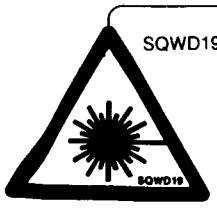
ADVARSEL: I dette a apparat anvendes laser.



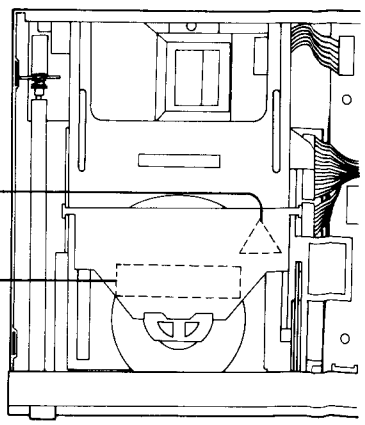
SQWD7

Obs:
Apparaten innehåller laser
Komponent av höger laserklass
än klass 1.

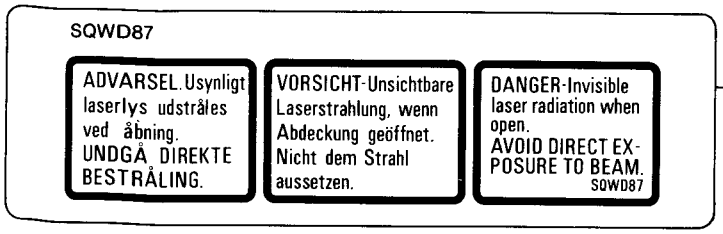
SQWD19



VAROITUS! Laite sisältää laserdiodin, joka lähettää näkymätöntä silmille vaarallista lasersäteilya

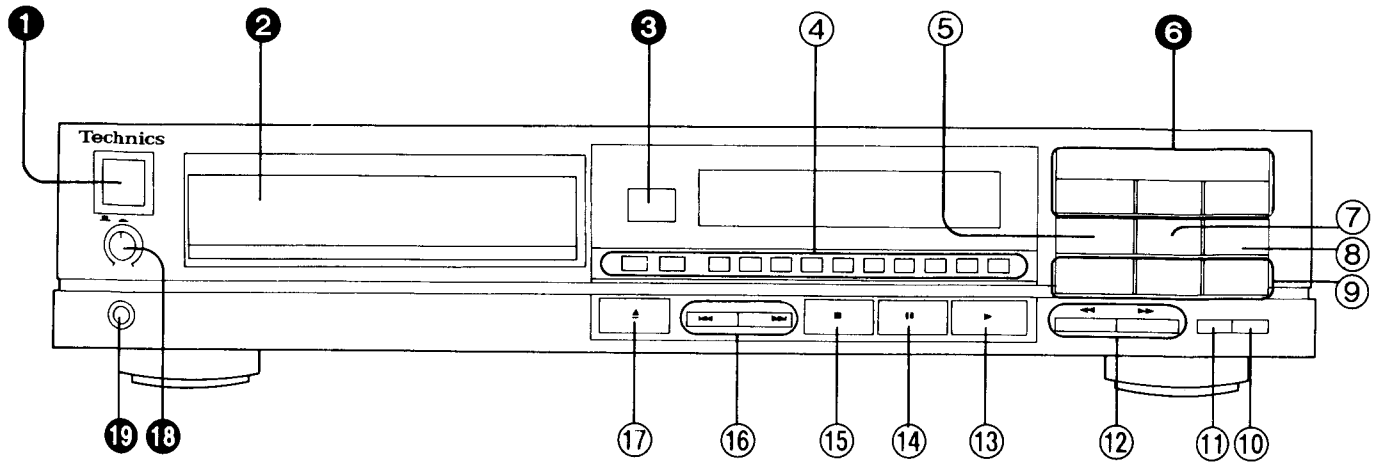


SQWD87


ADVARSEL. Usynligt laserlys udstråles ved åbning. UNDGÅ DIREKTE BESTRÅLING.
VORSICHT-Unsichtbare Laserstrahlung, wenn Abdeckung geöffnet. Nicht dem Strahl aussetzen.
DANGER-Invisible laser radiation when open. AVOID DIRECT EXPOSURE TO BEAM.
SQWD87

■ LOCATION OF CONTROLS

The functions indicated by the black numbers (with white background, ④ etc.) can also be activated using the remote control transmitter.



Control section

❶ Power switch (power)

If a disc has already been loaded, play will begin when the power is turned ON.

❷ Disc holder

❸ Remote control signal sensor (remote sensor)

④ Numeric buttons (+10, 0, 1~10)

⑤ Time mode select button (time mode)

❻ Buttons for edit function (edit)

- **Edit tape length button (tape length)**
  When compact discs are to be recorded to tape, this button can be used to calculate the number of tracks that can be recorded on each side of the tape, depending on the length of the cassette tape used, so that as little tape as possible is wasted.
- **Tape-side select button (side A/B)**
  When recording compact discs to tape, this button can be used to check the number of tracks and amount of tape left over for side A or B.
- **Disc link button (disc link)**
  This button can be used for edit recording from several discs.

⑦ Random play button (random)

This button can be used to play the tracks on a disc in a random sequence.

⑧ Music scan button (music scan)

This button can be used to play the first part of each track in order.

⑨ Buttons for program function

- **Programmed-play button (program)**
  Pressing this button initiates the programmed play mode. You can then enter specific tracks using the numeric buttons.
- **Clear button (clear)**
  This button can be used to clear tracks from the programmed sequence one at a time.
- **Recall button (recall)**
  This button can be used to display the contents of the programmed track sequence for confirmation.

⑩ Auto cue button (auto cue)

Pressing this button causes the unit to skip automatically to the beginning of the next track on the disc and switch to the play standby mode.

⑪ Repeat button (repeat)

⑫ Search buttons (◀◀ search ▶▶)

These buttons can be used to move rapidly forward or backward on the disc during play. The search speed is slow when the button is pressed at first and becomes faster if the button is pressed and held continuously.

⑬ Play button (▶ play)

⑭ Pause button (❚❚ pause)

⑮ Stop button (■ stop)

This button can be used to stop disc play, as well as to cancel the various play modes.

⑯ Skip buttons (⏮ skip/skip ⏭)

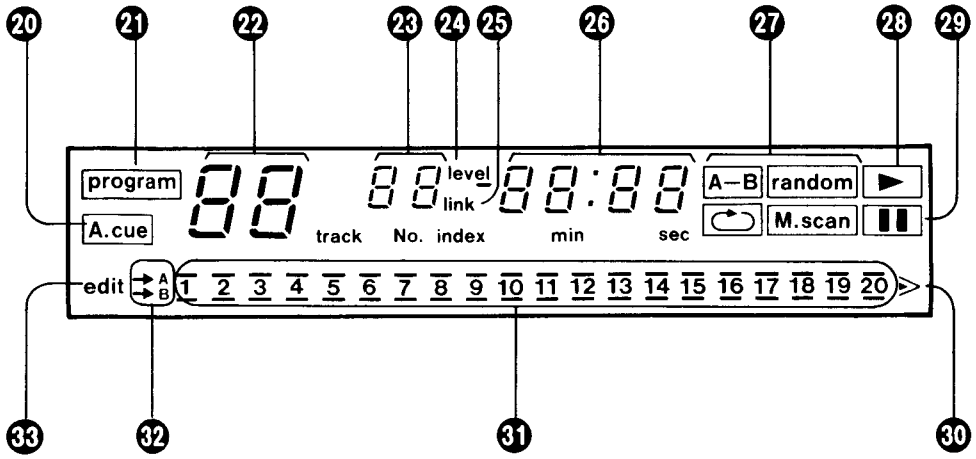
These buttons can be used to skip by track in the forward or reverse direction.

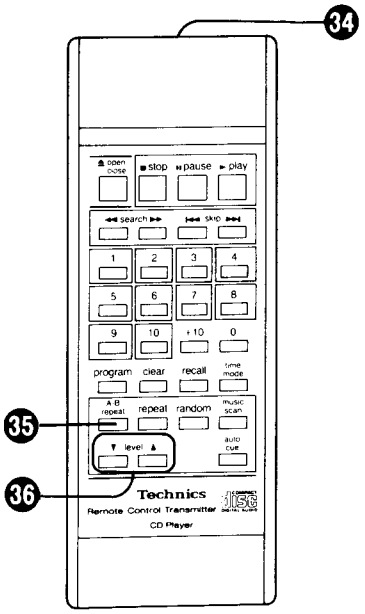
⑰ Disc holder open/close button (▲ open/close)

⑱ Headphones volume control (level)

Avoid listening to music at high volume levels for extended periods of time.

⑲ Headphones jack (phones)





Unnumbered buttons on the remote control transmitter function identically to their corresponding parts on the unit.

Indicators section

20 Auto cue indicator (A. cue)

21 Programmed-play indicator (program)

22 Track number display (track)

23 Index/program number display (index/No.)

24 Level indicator (level)

This indicator lights when the output level is attenuated by the remote control.

25 Disc link indicator (link)

26 Time display (min/sec)

27 Operation indicators

The following indicators light during their respective operations.

A-B: A-B repeat play (remote control operation)
random: Random play
: Repeat play
M. scan: Music scan

28 Play indicator (►)

29 Pause indicator (II)

30 "Over" mark (>)

This indicator lights if the total number of tracks on the disc is 21 or more.

31 Track number indicator (1–20)

32 Tape side indicator (A/B)

33 Compact disc edit indicator (edit)

Remote control transmitter

34 Remote control signal transmission window

35 A–B repeat button (A–B repeat)

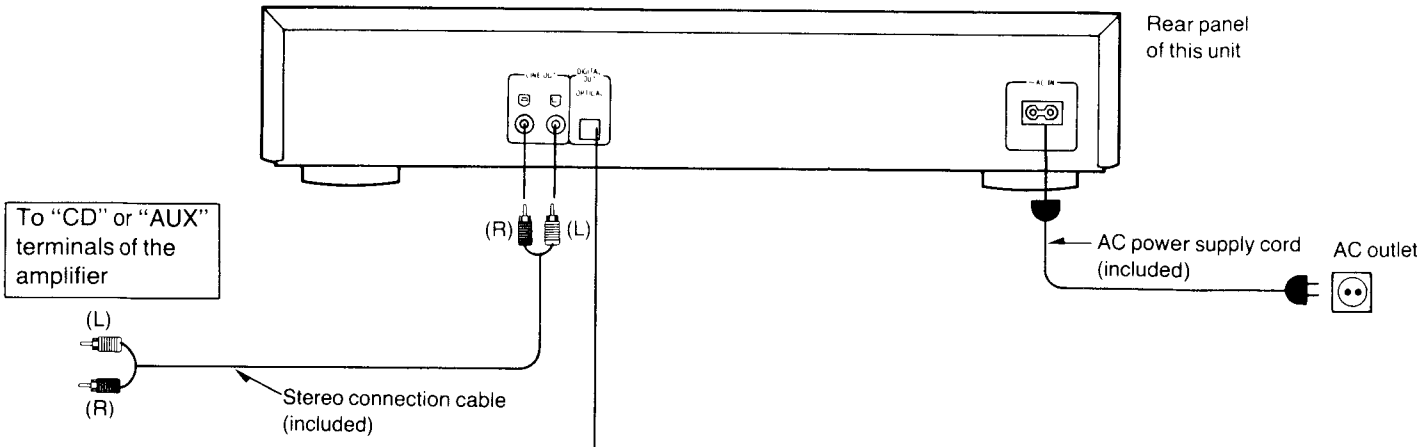
This button can be used to play the portion of a disc between two points (A and B) chosen by you.

36 Level buttons (▼ level ▲)

These buttons can be used to control output level (from 0 dB to −12 dB), except for digital output.

■ CONNECTIONS

Turn power off on all components before making connections.



•Optical output terminal (DIGITAL OUT/OPTICAL)
This terminal can be used for connection with other equipment that has a digital input terminal, such as an amplifier, by using an optical cable (optional). A dust-protection cap is inserted in this terminal. Remove this cap only when a connection is to be made to this terminal.

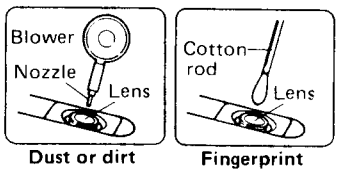
Note:
The configuration of the AC outlet and AC power supply cord differs according to area.

■ CLEANING OF LENS

If the lens is stained causing sound skip or operation failure, open the top cover by pressing the open button, and clean the lens.

• To remove dust or dirt

Blow the lens with the blower provided in the cleaning kit to remove dust or dirt.



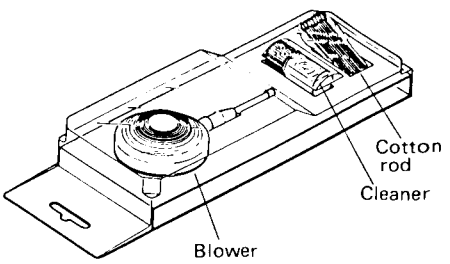
• To remove fingerprint

If the blower is not enough, moisten the cotton rod with the lens cleaner solution and wipe the lens with it from center of the lens to outside.

Cautions:

- Do not directly apply the cleaner solution to the lens. Do not apply too much solution to the cotton rod or otherwise the solution will flow into the player.
- Wipe the lens carefully. Do not give too much stress to the lens or otherwise it may scratch the lens or cause optical pickup trouble.
- If the solution should be too much applied, wipe the lens with a dry cotton rod.

Lens cleaning kit (Part No. : SZZP1038C)



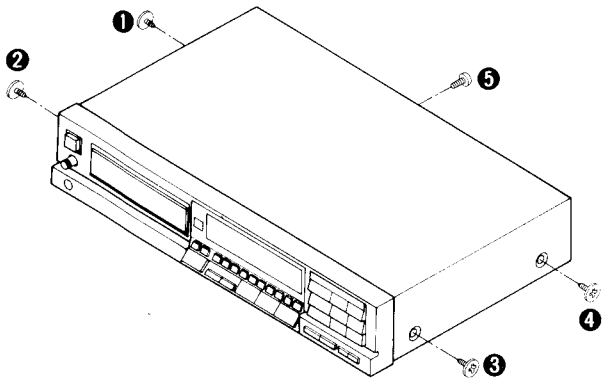
■ DISASSEMBLY INSTRUCTIONS

Warning: This product uses a laser diodes. Refer to caution statements on page 3.

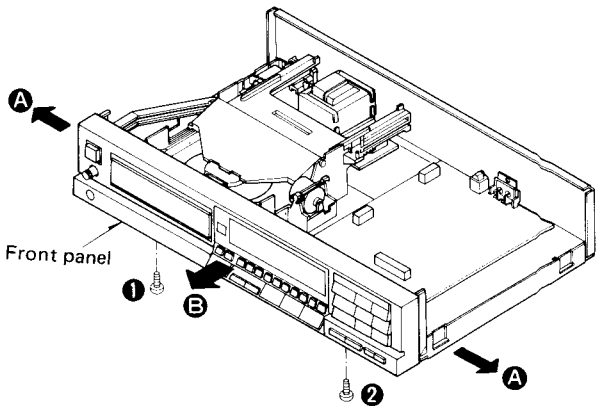
ACHTUNG: • Die lasereinheit nicht zerlegen.
• Die lasereinheit darf nur gegen eine vom hersteller spezifizierte einheit ausgetauscht werden.

*** This CD player is equipped with FPC boards, so handle them with care during disassembly and reassembly.**

Ref. No. 1	How to remove the cabinet
Procedure 1	1. Remove the 5 screws (❶ ~ ❺).

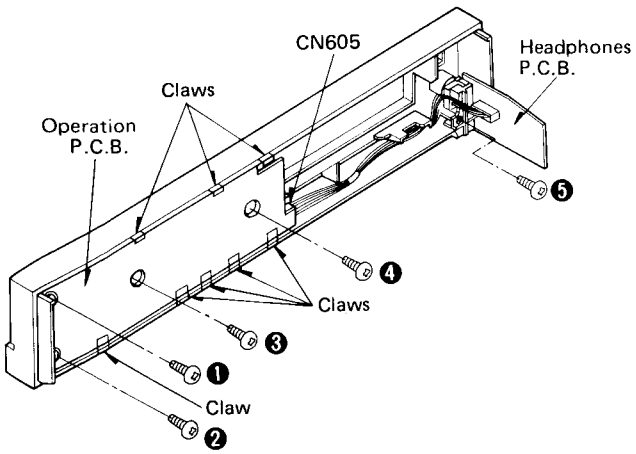


Ref. No. 2	How to remove the front panel
Procedure 1→2	1. Remove the 2 screws (❶, ❷). 2. Slightly pull out the front panel in the direction of the arrow (Ⓐ). 3. Remove the front panel in the direction of the arrow (Ⓑ).

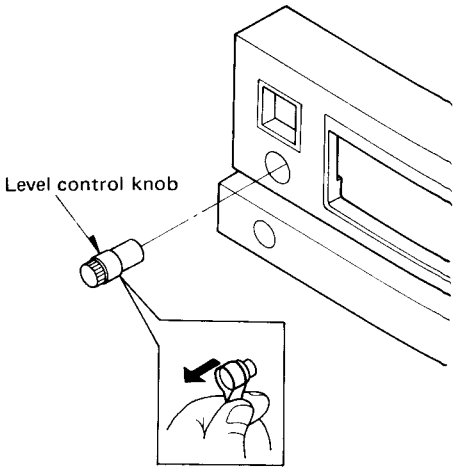


Ref. No. 3	How to remove the operation P.C.B. and headphones P.C.B.
Procedure 1→2→3	

A. Operation P.C.B.
1. Remove the 4 screws (❶ ~ ❹).
2. Remove the connector (CN605).
3. Release the 8 claws.



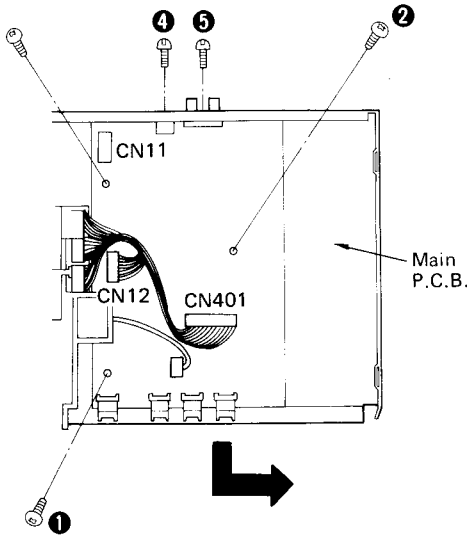
B. Headphones P.C.B.
1. Remove the level control knob.
2. Remove the screw (❺).



Ref. No. 4 — **How to remove the main P.C.B.**

Procedure 1→2→3→4

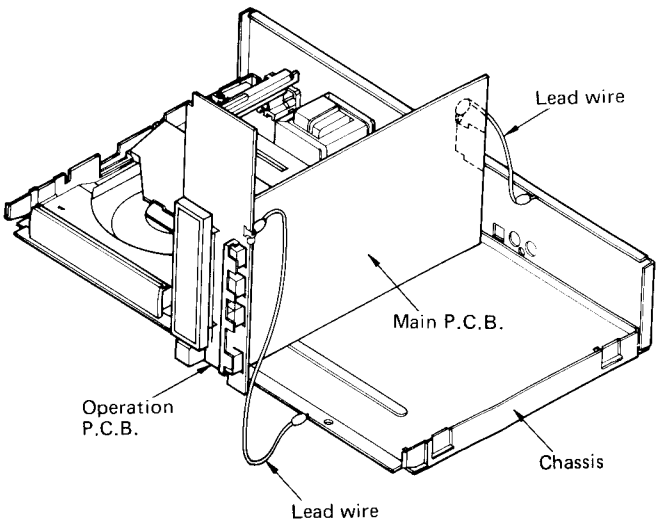
1. Remove the 5 screws (❶~❺).
2. Remove the 3 connectors (CN11, CN12, CN401).
3. Lift the main P.C.B. off the retention posts on the chassis.
4. Remove the main P.C.B. in the direction of the arrow.



How to check the main P.C.B.

When checking the soldered surface of the main P.C.B. and replacing the parts, do as shown below.

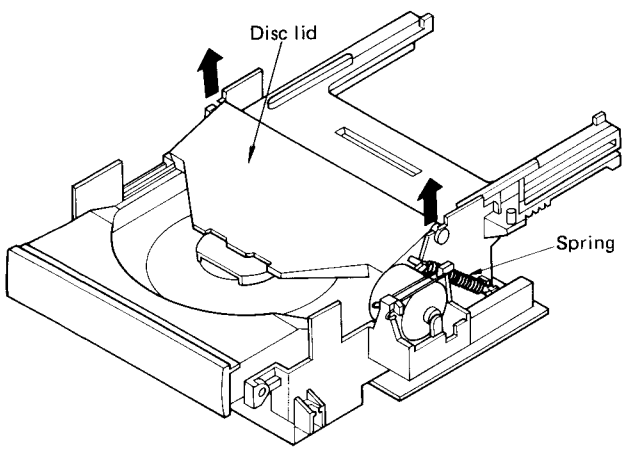
1. Connect the main P.C.B. ground terminal (LINE OUT terminal) to the chassis with a lead wire.
2. Connect the operation P.C.B. ground terminal to the chassis with a lead wire.

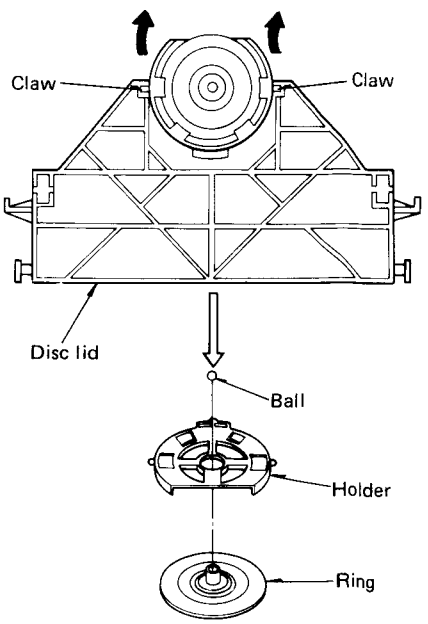


Ref. No. 5 — **How to remove the disc lid**

Procedure 1→5

1. Remove the spring.
2. Pull out the disc lid in the direction of the arrow.
3. Push the 2 claws in the direction of the arrow.





Caution: Be sure to handle the small ball carefully.

Ref. No. 6	How to remove the disc holder and power switch rod

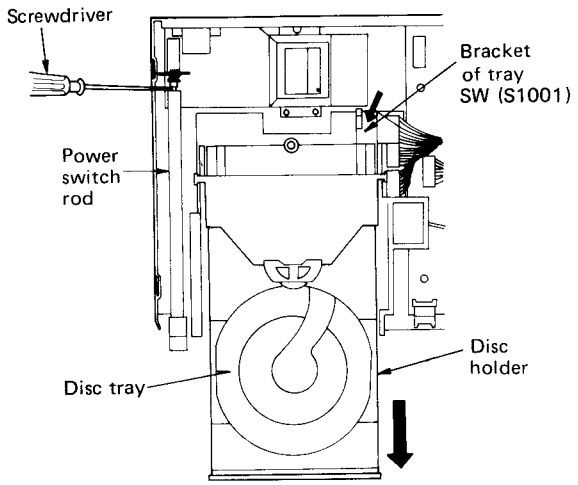
Procedure 1→2→5→6

A. Disc holder

1. Pull the disc holder slowly in the direction of the arrow until the disc tray comes up.
2. Pull the disc holder until it stops.
3. Push the bracket of tray SW (S1001) in the direction of the arrow.
4. Pull out the disc holder further to remove it.

B. Power switch

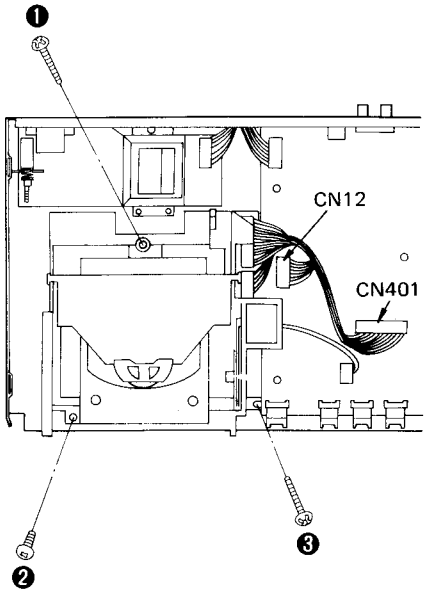
1. Set the power switch in the "OFF" position.
2. Remove the power switch rod by using a screwdriver.



Ref. No. 7	How to remove the loading unit

Procedure 1→2→5→6→7

1. Remove the 3 screws (❶~❸).
2. Remove the 2 connectors (CN12, CN401).

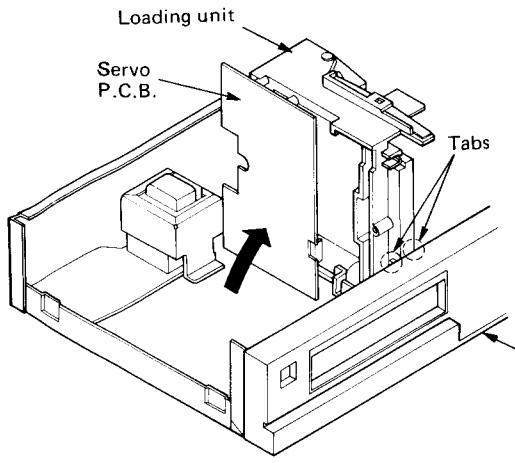


Ref. No. 8	How to check the servo P.C.B.

Procedure 1→7→8

- When checking the soldered surfaces of the servo P.C.B. and replacing the parts, do as shown below.

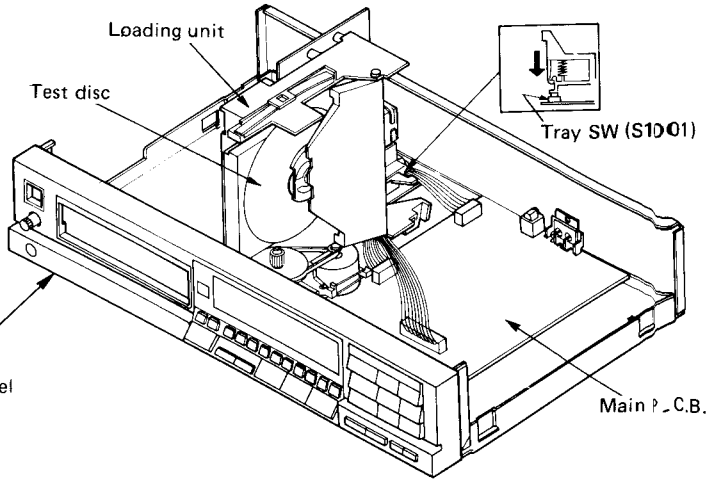
Note: Insert the loading unit into the tabs of the front panel. (Fixed loading unit)



(To play a disc)

1. Place the test disc.
2. Turn "ON" the power switch of the player.
3. Push the bracket of tray SW (S1001) in the direction of the arrow and release it.

Note: If the test disc fails to rotate, press the tray switch again.



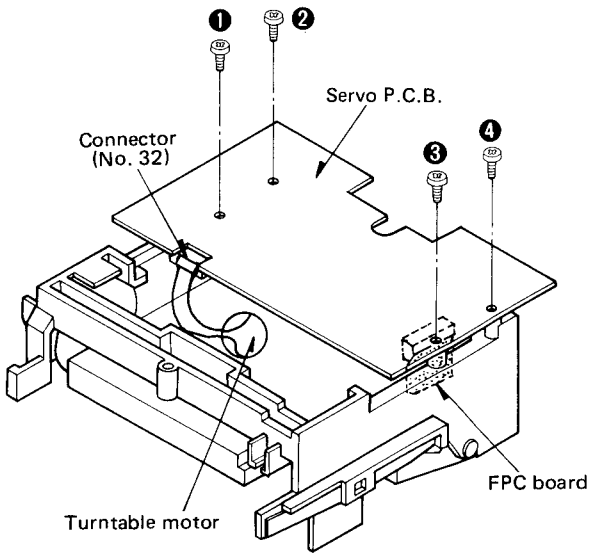
D

Ref. No. 9	How to remove the servo P.C.B.

Procedure 1→2→5→6→7→9

1. Remove the 4 screws (❶~❹).
2. Remove the FPC board from the optical pickup.
3. Remove the connector (Ref. No. 32) of the turntable motor.

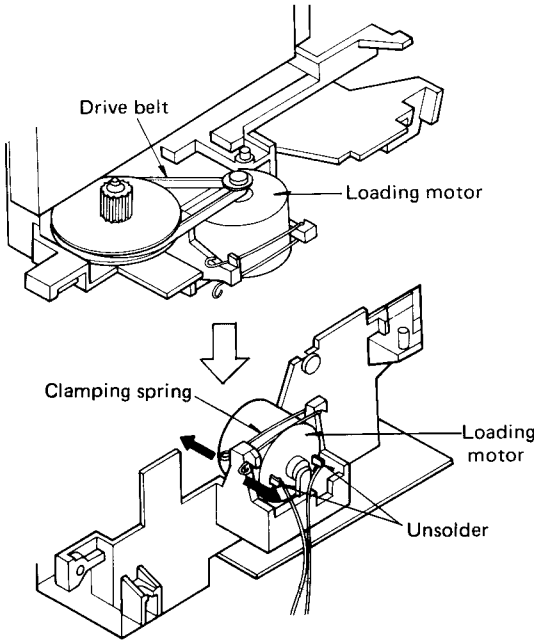
Caution: To prevent the breakdown of the laser diode, antistatic shorting pin is inserted into the FPC board.



Ref. No. 10	How to remove the loading motor

Procedure 1→6→10

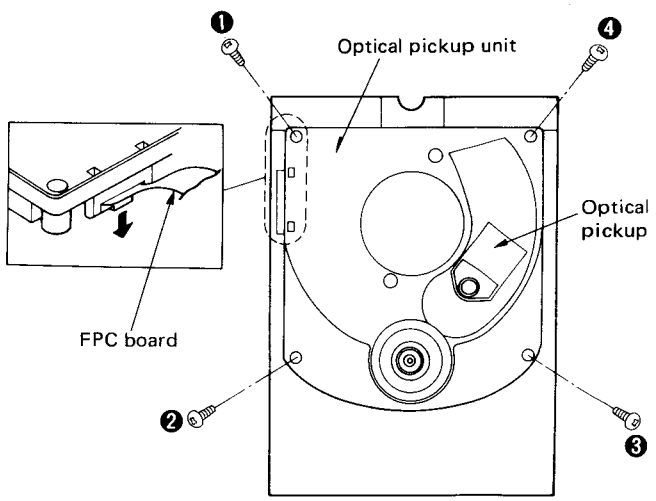
1. Remove the drive belt.
2. Release the clamping spring.
3. Unsolder the 2 terminals of the lead wire of the loading motor.



Ref. No. 11	How to remove the optical pickup unit

Procedure 1→2→5→6→7→9→11

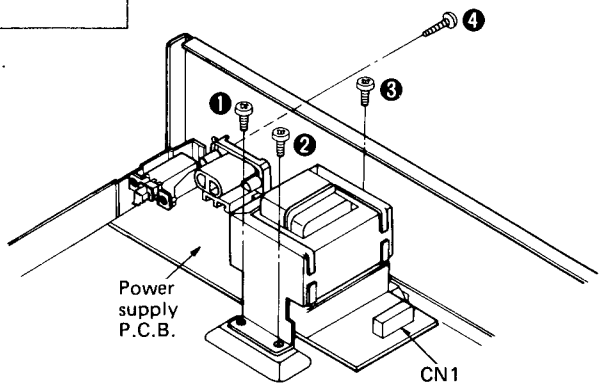
1. Remove the 4 screws (❶~❹).
2. Remove the FPC board from the optical pickup.



Ref. No. 12	How to remove the power supply P.C.B.

Procedure 1→6→12

1. Remove the 4 screws (❶~❹).
2. Remove the connector (CN1).



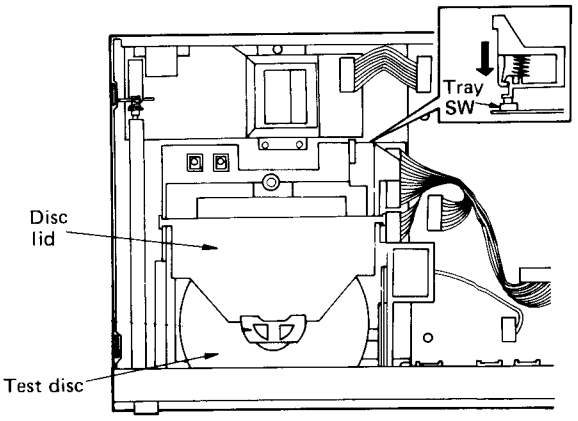
■ MEASUREMENTS AND ADJUSTMENTS

Caution:
It is very dangerous to look at or touch the laser beam. (Laser radiation is invisible.)
With the unit turned "on", laser radiation is emitted from the pickup lens.
Avoid exposure to the laser beam, especially when performing adjustments.

PREPARATION

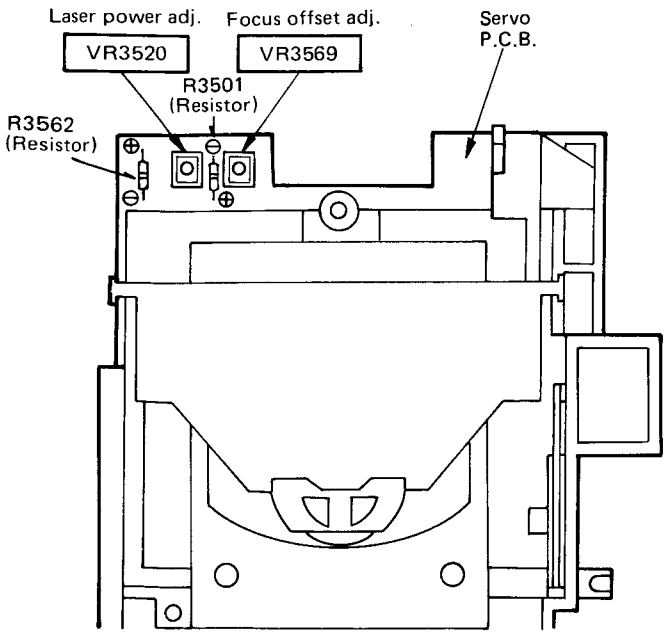
1. Remove the cabinet (see Ref No. 1 of the disassembly instructions.)
2. Remove the disc holder (see Ref No. 6 of the same).
3. Place the test disc on the turntable.
4. Turn "ON" the power switch at the player.
5. Push the bracket of tray SW (S1001) in the direction of the arrow and release it.

Note: If the test disc fails to rotate, press the tray switch again.

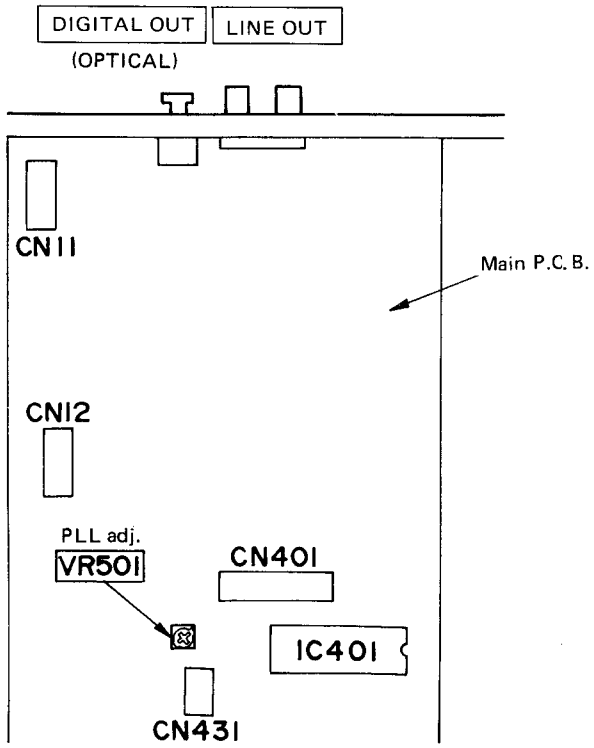


ADJUSTMENT POINTS

• **Servo P.C.B.**



• **Main P.C.B.**



D

Measuring Instruments

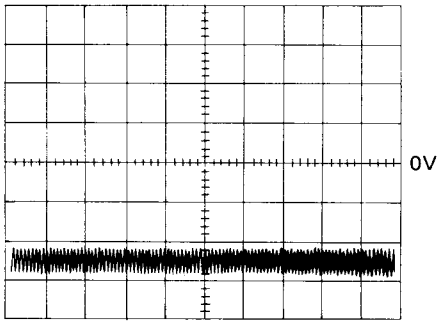
* Playability test disc (SZZP1054C).
* Normal disc.
* Dual-beam oscilloscope with bandwidth of 30MHz or better (with EXT trigger and 1:1 probe).

(1) LASER POWER ADJUSTMENT

1. Connect the oscilloscope's CH1 probe across (+) and (–) of **R3501** (Resistor) on the servo P.C.B.
2. Switch the player power ON, and play track No. 1 on the test disc (SZZP1054C).
3. Adjust **VR3520** so that the voltage is **–50 ± 2mV.**

Oscilloscope setting:

VOLT . . . . . 20mV INPUT . . . . . DC
SWEEP . . . . . 0.2msec.

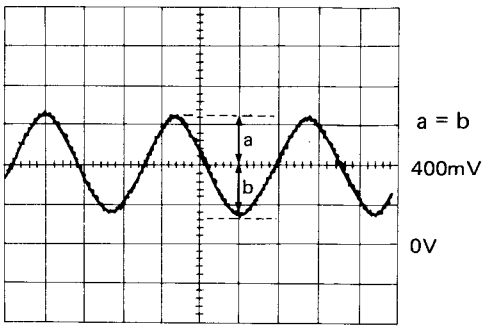


(2) FOCUS OFFSET ADJUSTMENT

1. Connect the oscilloscope's CH1 probe across (+) and (–) of **R3562** (Resistor) on the servo P.C.B.
2. Switch the player power ON, and play track No.1 on the test disc (SZZP1054C).
3. Adjust **VR3569** until the signal amplitude become in the center of **400mV.**

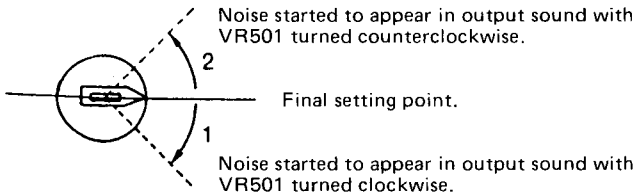
Oscilloscope setting:

VOLT . . . . . 200 mV INPUT . . . . . DC
SWEEP . . . . . 50msec.

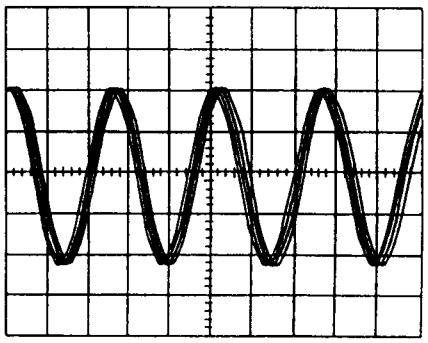


(3) PLL ADJUSTMENT

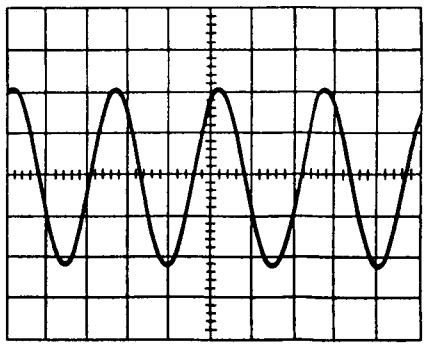
1. Connect CH1 of the oscilloscope to the **LINE OUT terminal** (either of Lch or Rch) and **ground.**
   Oscilloscope setting: VOLT 1V
   SWEEP . . . . . 1msec.
   INPUT . . . . . DC
2. Switch the player power ON, and play track No. 6 (wedge 0.7mm) on the test disc (SZZP1054C).
3. Check the waveform displayed on the oscilloscope and adjust **VR501** in the following steps.
   Step 1. Turn **VR501** clockwise slowly and observe the point at which the waveform on the oscilloscope begins to be disturbed.
   Step 2. Turn **VR501** counterclockwise slowly and observe the point at which the waveform on the oscilloscope begins to be disturbed.
   Step 3. Set **VR501** in the middle between the points observed in the above steps "1" and "2".


Noise started to appear in output sound with VR501 turned counterclockwise.
2
Final setting point.
1
Noise started to appear in output sound with VR501 turned clockwise.

• **NG**



• **OK**



(4) CHECK OF PLAY OPERATION AFTER ADJUSTMENT

*** Checking Skip Search**

1. Play an ordinary musical program disc.
2. Press the skip button to check for normal skip search operation (in both the forward and reverse directions).

*** Checking Manual Search**

1. Play an ordinary musical program disc.
2. Press the manual search button to check for smooth manual search operations at either low or high speed (in both the forward and reverse directions).

*** Playability check by test disc**

1. Play the 0.7 mm black dot and the 0.7 mm wedge on the defect test disc (SZZP1054C) and verify that no sound skip or noise occurs.

D

■ TERMINAL FUNCTIONS OF IC's

• IC6501 (TDA8808T): Photo diode signal processor

Pin No.	Mark	I/O Division	Function
1	GCHF	I	Gain control input of HF amplifier. Current output from HF amplitude detector
2	Vp	I	Positive supply voltage
3	HFout	O	HF amplifier and equalizer voltage output
4	DET	I	HF detector voltage input
5	Sc	I	Starting up capacitor input
6	Si/$\overline{RD}$	I/O	On/off control (start input); ready signal output (starting up procedure successful)
7	Beq	I	Equalizer reference current input
8	Bgc	I	DC and LF gain control reference current input
9	FOC START	I	Focus normalizing circuit starting current
10	PLLH	O	PLL on hold output
11	$\overline{TL}$	O	Track loss output
12	$\overline{DODS}$	I	Drop out detector suppression input
13	Vext	I	Negative supply connection for FE and FElag output stage; also substrate connection
14	LPF	O	Low pass filter for Iret, used in track loss ($\overline{TL}$) detector and LF gain control
15	FE	O	Current output of normalized, switched focus error signal
16	FElag	O	Current output of switched focus error signal, intended for lag network
17	LO	O	Laser amplifier current output
18	LM	I	Laser monitor diode input
19	GCLF	I	Gain control input for AC and LF amplifiers. Current output from LF amplitude detector
20	Re2	O	Summation of amplified currents from D3 and D4
21	Re1	O	Summation of amplified currents from D1 and D2
22, 23	D1, D2	I	Current inputs to DC and LF photo diode amplifier
24, 25	D3, D4	I	Current input to DC and LF photo diode amplifier
26	HFin	I	Current input to HF amplifier
27	GND	I	Ground connection of device
28	DEC	I	Decoupling input (internal bypass)

• IC6503 (TDA8809T): Radial error signal processor

Pin No.	Mark	I/O Division	Function
1	Vp	I	Positive supply voltage
2	Cosc1	I	Frequency setting capacitors for oscillator
3	Cosc2		
4	Rwob	I	Wobble generator input
5	Rosc	I	Biassing resistor for oscillator frequency and internal amplitude
6	$\overline{DIV4}$	I	Divide-by-4 input
7	REdig	O	Digital output of sign (Re2 – Re1)
8	B3	I	Input control bits for off-, catch-, plat- status and DAC output current
9	B2		
10	B1		
11	B0		
12	Vext(+)	I	Positive external voltage input
13	Vext(–)	I	Negative external voltage input (also substrate connection)
14	GND	I	GND terminal
15	RADout	O	Current output of amplified (Re2 – Re1) input currents
16	REin	I	Radial error input
17	RElag	O	Voltage output of integrated (Re2 – Re1) input currents
18	Lag	I	Connection of integrator capacitor for (Re1 – Re2) input currents
19	Lead	O	Lead output
20	Vref	I	Internal reference voltage output
21	AGC	I	Gain control input for radial error signal
22	RDAC	O	Biassing resistor for current output for track jumping (3½ bits)
23	offset in	I	Offset control input for radial offset
24	offset off	O	Offset control output for radial offset
25	CLPF	I	Low-pass filter for Re1 and Re2, used for radial offset control
26	CHPF	I	High-pass filter for Re1 and Re2, used for radial offset control
27	Re1	I	Input for amplified currents from photo-diodes D1 and D2
28	Re2	I	Input for amplified currents from photo diodes D3 and D4

• IC301 (MN6625): Digital signal processing

Pin No.	Mark	I/O Division	Function
1	BYTCK	O	Serial data byte clock (Not used, open)
2	FCLK	O	Crystal frame clock (Not used, open)
3	DEMPH	O	De-emphasis ON signal (de-emphasis ON at "H") (Not used, open)
4	SRDATA	O	Serial data output (MSB first)
5	SCK	O	Serial bit clock output
6	LRCK	O	LR discrimination clock (88.2kHz)
7	WDCK	O	Serial data output word clock (Not used, open)
8	LDG	O	L channel deglitch signal (Not used, open)
9	RDG	O	R channel deglitch signal (Not used, open)
10	IPFLAG	O	Interpolation flag (interpolation at "H") (Not used, open)
11	FLAG	O	Error flag terminal (Not used, open)
12	XCK	O	Clock (16.9344MHz) output (Not used, open)
13	TEST	I	Test mode selection (Not used, connected to +5V)
14	TX	O	Digital signal output
15	SLEEP	I	Mode selector ("L":normal, "H":SLEEP mode) (Not used, connected to GND)
16	CSEL	I	Test terminal ("L": normal) (Not used, connected to GND)
17	X1	I	Clock input (16.9344MHz)
18	X2	O	Clock output (16.9344MHz) (Not used, open)
19	VSS	I	GND terminal
20	BLKCK	O	Sub-code Q data block clock (75Hz)
21	$\overline{\text{CLDCK}}$	O	Sub-code frame clock (7.35kHz)
22	$\overline{\text{SUBQ}}$	O	Sub-code Q data
23	$\overline{\text{RST}}$	I	Reset command
24	MLD	I	Load command for mode control data

Pin No.	Mark	I/O Division	Function
25	MCLK	I	Data clock for MDATA
26	MDATA	I	Mode control data
27	DMUTE	I	Data mute command
28	$\overline{\text{TRON}}$	I	Tracking servo ON signal (tracking servo ON at "L")
29	STAT	O	Status command for CRC etc. . .
30	SUBC	O	Sub-code serial output data (Not used, open)
31	SBCK	I	Clock for sub-code serial output (Not used, open)
32	SMCK	O	System clock (4.2336MHz)
33	VDD	I	Power supply (connected to +5V)
34	MEMP	I	Deemphasis command
35	FG	I	Turntable motor FG signal input (Not used, open)
36	PC	O	Turntable motor ON command (ON at "L")
37	EC	O	Turntable motor drive signal
38	RESY	O	Resynchronizing signal (Not used, open)
39	DO	I	Drop-out detection signal (Drop-out at "H")
40	SRF	I	Sliced RF signal
41	EFM	I	Modulation data
42	PCK	I	PLL extract clock (4.2336MHz)
43	FPC	O	PLL frequency comparision signal
44 ⟆ 51	D7 ⟆ D0	I/O	16K RAM data input/output
52	RAM OE	O	Read out enable
53	RAM WE	O	Write enable
54 ⟆ 64	RAM A0 ⟆ RAM A10	O	16K RAM address signal (RAMA0: LSB, RAMA10: MSB)

• IC401 (MN1554PJE-2): System control

Pin No.	Mark	I/O Division	Function
1	VSS	I	GND terminal
2	DMUTE	O	Data mute command
3	MDATA	O	Mode control data
4	MCLK	O	Data clock for MDATA
5	MLD	O	Load command for mode control data
6	NC	–	Not connected
7	NC	–	Not connected
8	INH	O	Track loss det. signal output
9	MUTE	O	Muting signal output
10	EMPH	O	Deemphasis command
11	NC	–	Not connected
12	SIRQ	I	Track loss det. signal input
13	BLKCK	I	Sub-code Q data block clock (75 Hz)
14	$\overline{\text{CLDCK}}$	I	Sub-code Q data frame clock (7.35 KHz)
15	NC	–	Not connected
16	SUBQ	I	Sub-code Q data
17	RESET	I	Reset command
18	TL	I	Track loss signal
19	RE DIG	I	Radial error digital
20	HFD	I	HF detector output for PLLH
21	TRAY SW	I	Disc holder open/close det. signal input
22	DIV4	O	Radial error digital divided by four
23	DODS	O	Drop out detector suppression
24	MODEA	–	Not used, open
25	FR/REV	–	Not used, open
26	B0	O	Control bits for radial circuit
27	B1		
28	B2		
29	B3		
30	CLOSE	O	Disc tray "close" detection
31	OPEN	O	Disc tray "open" detection

Pin No.	Mark	I/O Division	Function
32	TR ON	O	Tracking servo ON command
33	VDD	I	Power supply (connected to +5V)
34	NC	–	Not connected
35	NC	–	Not connected
36	P53	–	Not used, open
37	P60	I	Period det. select signal input
38	POL	I	Period det. select signal input
39	SKATE	I	Period det. select signal input
40	STAT	I	Status command for CRC etc. . . .
41	SP0	I	Speed control code input
42	SP1		
43	SP2		
44	SP3		
45	RECV	I	Data receipt command signal
46	SEND	I	Data transmission command signal
47	ACK	I	Data discrimination signal
48	CLK	I	Data clock signal
49	DATA0	I	Key scan signal
50	DATA1		
51	DATA2		
52	DATA3		
53	CMD0	O	Command signal of access mode
54	CMD1		
55	CMD2		
56	CMD3		
57	NC	–	Not connected
58	NC	–	Not connected
59	NC	–	Not connected
60	SI/RD	I/O	On/off control for laser supply and focus circuit
61	OSC2	I	Clock input
62	OSC1	I	Clock input (4.2336 MHz)
63	XI	I	Digital input of signal
64	X0	–	Not used, open

D

• IC403 (MN1551 PJF-1):

Pin No.	Mark	I/O Division	Function
1	VDD	I	Power supply (connected to +5V)
2	NC	–	Not connected
3	NC	–	Not connected
4	TL	I	Track loss signal
5	REDIG	I	Radial error digital
6	DIV4	I	Radial error digital divided by four
7	SP3	O	Speed control code output
8	SP2		
9	SP1		
10	SP0		
11	SKATE	O	Period det. select signal output
12	POLAR	O	Period det. select signal output
13	DIVC	O	Period det. select signal output
14	SIRQ	O	Track loss det. signal output

Pin No.	Mark	I/O Division	Function
15	CMD0	I	Command signal of access mode
16	CMD1		
17	CMD2		
18	CMD3		
19	NC	–	Not connected
20	NC	–	Not connected
21	NC	–	Not connected
22	NC	–	Not connected
23	NC	–	Not connected
24	SYNC	–	Not connected
25	RESET	I	Reset command
26	OSC2	I	192 fs (8.4672 MHz) clock input
27	OSC1		
28	VSS	I	GND terminal

• IC601 (MN15283PEY–1): System control and FL drive

Pin No.	Mark	I/O Division	Function
1	VSS	I	GND terminal
2	X0	O	Not used, open
3	X1	I	Optical servo condition input (Not used, open)
4	O0 (RECV)	O	Data receipt command signal
5	O1 (SEND)	O	Data transmission command signal
6	O2 (ACK)	O	Data discrimination signal
7	O3 (CLK)	O	Data lock signal
8 ≀ 11	10 (D0) ≀ 13 (D3)	O	Key scan signal
12	SYNC	O	Not used, open
13	RST	I	Reset command (reset at "L")
14	IRQ/TC1	I	Remote control signal input
15 ≀ 18	50 ≀ 53	I	Key return signal
19	SBT	I	Sub-code frame clock (7.35 kHz) (Not used, open)
20	SBD	I	Sub-code Q data input (Not used, open)
21 ≀ 24	20 ≀ 23	O	Key scan signal
25	30	O	Key scan signal
26	31		

Pin No.	Mark	I/O Division	Function
27	32	–	Not used, open
28	33	O	Key scan signal
29	40	I	Key return signal
30	41		
31	42	–	Not used, open
32	43	–	Not used, open
33	P60	–	Not used, open
34	P61	–	Not used, open
35	DAC	–	Not used, open
36	VPP	I	FL drive power supply (connected to –28.3V)
37 ≀ 52	D0 ≀ D9 • DA ≀ DF	O	FL grid signal
53 ≀ 61	S8 ≀ S0	O	FL anode signal
62	VDD	I	Power supply (connected to +5V)
63	OSC2	I	Clock terminal
64	OSC1	I	Clock input

D

• IC501 (AN8371S): Data slice and PLL

Pin No.	Mark	I/O Division	Function
1	VEE	I	Power supply (connected to −5V)
2	SRF	O	Sliced RF signal
3	EFM	O	Modulation data
4	D.GND	I	GND terminal (digital system)
5	PCK	O	PLL extract clock (4.2336MHz)
6	VCC	I	Power supply (connected to +5V)
7	VA	I	VCO free run frequency adjusting current input (Not used, open)
8, 9	VC1, 2	I	Capacitor connection for VCO oscillator frequency
10	VR	I	Resistor connection for VCO oscillator frequency
11	PD	I	Capacitor connection for PLL DO protection
12	PL1	I	PLL loop filter connection

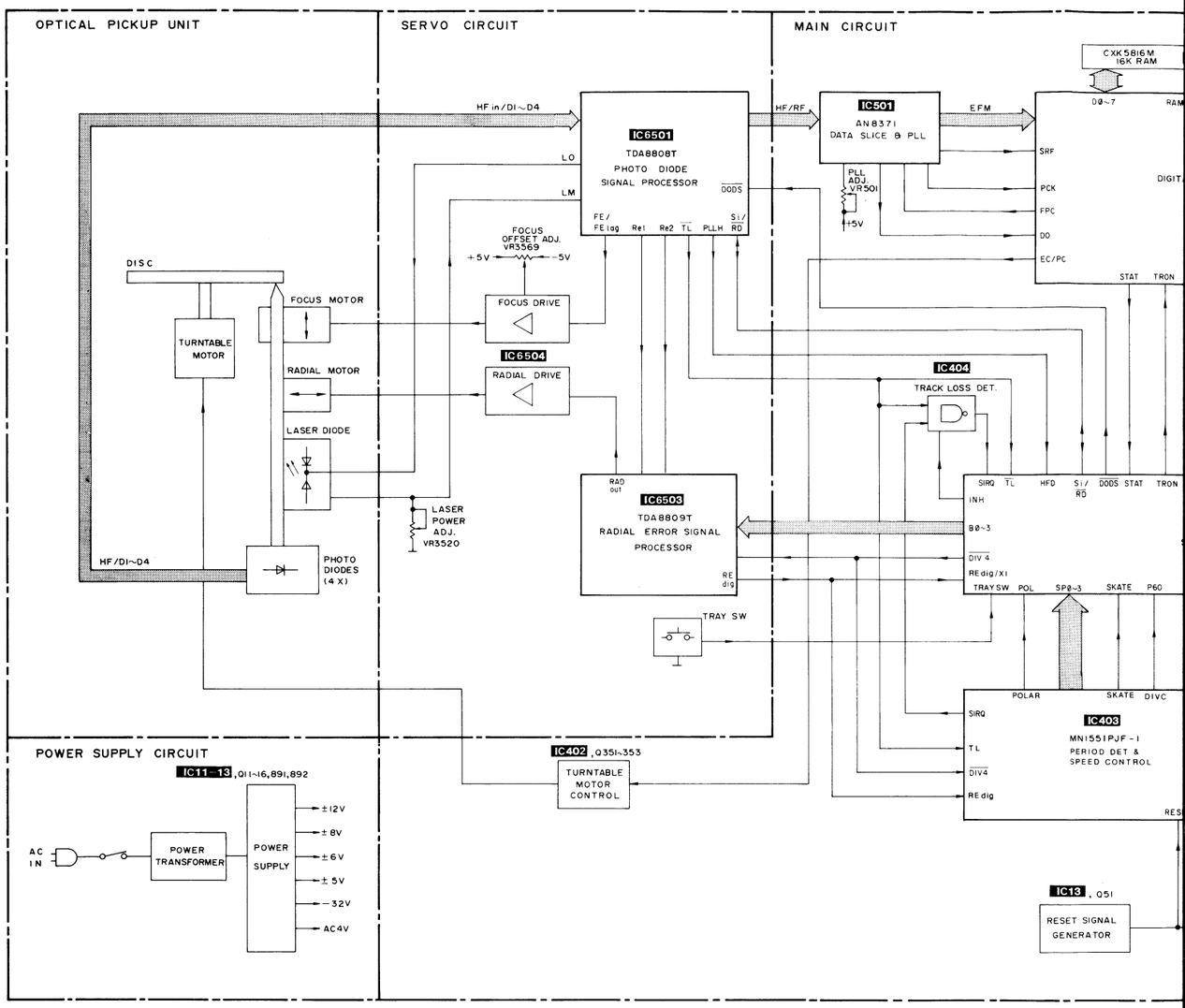
Pin No.	Mark	I/O Division	Function
13	PL2	I	PLL loop filter connection
14	FPC	I	PLL frequency comparison signal
15	RF	I	Data
16	ARF	O	RF signal output with AGC output
17	AGC	I	ARF signal input for AGF drop-out detection input
18	AC	I	Loop filter for AGC connected
19	DO	O	Drop-out detection signal
20	A.GND	I	GND terminal (analog system)
21	DSL	I	RF signal input for data slicing
22	SLC	I	Slicing level control signal input (Not used, connected to GND)
23	FC1	I	Filter capacitor for data slicer connected
24	FC2	I	Filter capacitor for data slicer connected

•IC801 (MN6471): Digital filter and D/A converter

Pin No.	Mark	I/O Division	Function
1	MLD	I	Command load input (load: L)
2	RSTB	I	Reset command
3	IE	I	Not used, connected to GND
4	TP1	—	TEST terminal
5	TP2	—	
6	TEST1	I	TEST terminal 1 (connected to GND)
7	TEST2	I	TEST terminal 2 (connected to GND)
8	NC	—	Not connected
9	NC	—	Not connected
10	AVDD4	I	Power supply (connected to +4.7V)
11	OUTL (−)	O	Lch data output, (−) terminal
12	AVSS4	I	GND terminal
13	AVSS3	I	GND terminal
14	OUTL (+)	O	Lch data output, (+) terminal
15	AVDD3	I	Power supply (connected to +4.7V)
16	NC	—	Not connected
17	AVDD2	I	Power supply (connected to +4.7V)
18	OUTR (+)	O	Rch data output, (+) terminal
19	AVSS2	I	GND terminal (analog system)
20	AVSS1	I	GND terminal (analog system)
21	OUTR (−)	O	Rch data output, (−) terminal

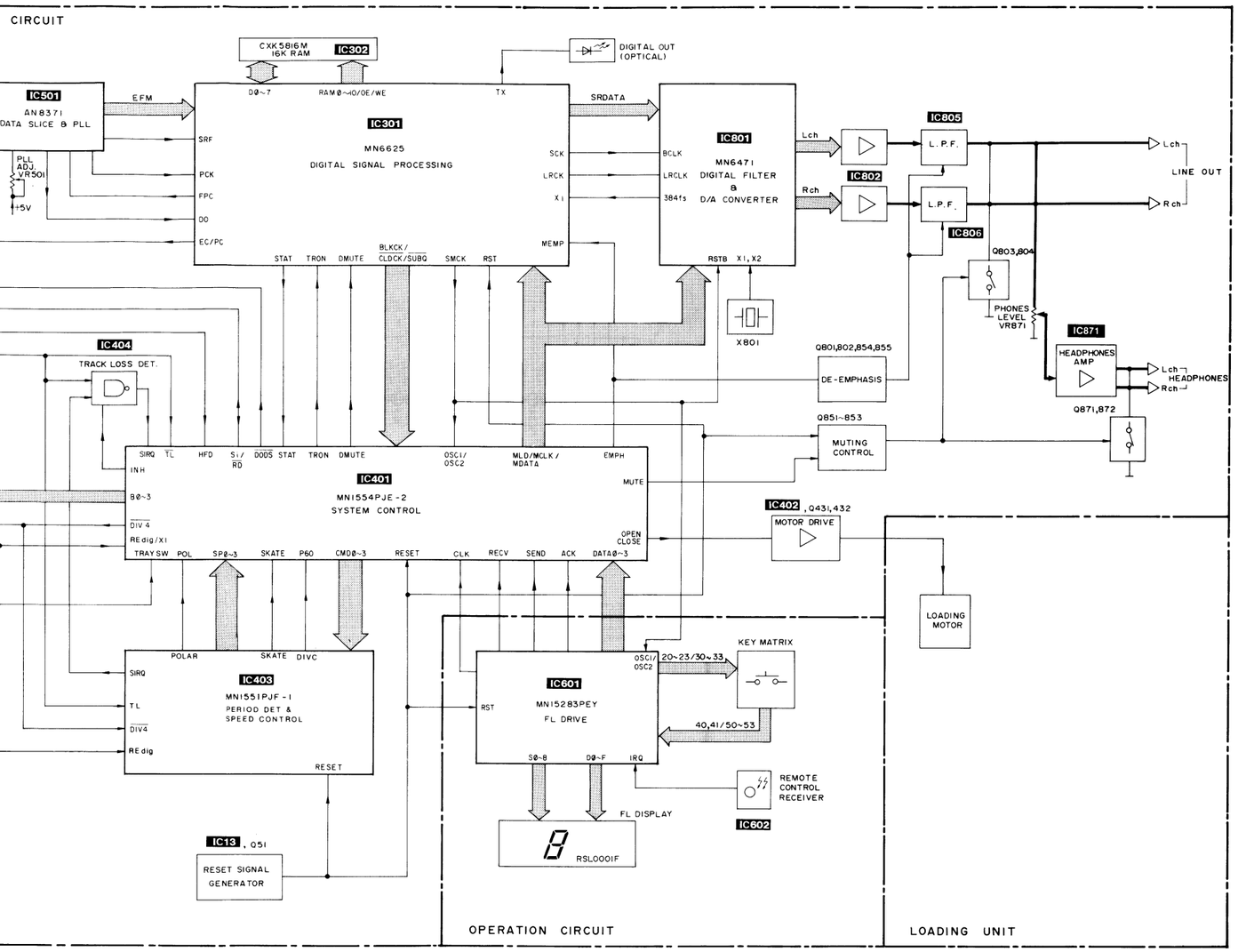
Pin No.	Mark	I/O Division	Function
22	AVDD1	I	Power supply (connected to +4.7V)
23	DVDD1	I	Power supply (connected to +4.3V)
24	DVSS1	I	GND terminal (digital system)
25	X2	O	Clock output
26	X1	I	Clock input
27	NC	—	Connected to GND
28	DVDD2	I	Power supply (connected to +4.3V)
29	DVSS2	I	GND terminal (digital system)
30	NSUB	I	Sub-strate terminal (Not used, connected to +4.3V)
31	ZFLGB	O	Zero input detector terminal (Not used, open)
32	192fs	O	192 fs (8.4672MHz)
33	LRPOL	I	LR clock selector (Not used, connected to +4.3V)
34	LRCLK	I	LR discrimination signal input
35	BCLK	I	Serial bit clock input
36	SRDATA	I	Serial data input (MSB first)
37	DVSS 3	I	GND terminal (digital system)
38	DVDD	I	Power supply (connected to +4.3V)
39	384 fs	O	384 fs (16.9344MHz) output
40	PD	I	Power down terminal (Not used, connected to GND)
41	MDATA	I	Mode control data
42	MCLK	I	Data clock for MDATA

■ BLOCK DIAGRAM



B0-B3 : Control bits for radial circuit.
DAC : Current output for track jumping. (Digital to Analogue Converted)
$\overline{DODS}$: Drop out detector supression.
D1-D4 : Photodiode currents.
FE : Focus error signal.
FE lag : Focus error signal for LAG network.
HF : HF output for DEMOD.
HFD : HF detector output for DEMOD.
HF-in : HF current input.
LM : Laser monitor diode input.
LO : Laser amplifier current output.
RE : Radial error signal (amplified RE2 -RE1 currents).
RE1 : Radial error signal 1 (summation of amplified currents D3 and D4).
RE2 : Radial error signal 2 (summation of amplified currents D1 and D2).
RE dig : Radial error digital.
RE lag : Radial error signal for LAG network
$\overline{RPU}$: Radial puls after track jumping.
Si/$\overline{RD}$: On/off control for laser supply and focus circuit.
$\overline{TL}$: Track loss signal.
Div4 : Radial error digital devided by four.
RF : Data
DO : Drop-out detection signal (Active High)
SRF : Sliced RF signal.
EFM : Modulation data.
PCK : PLL extract clock (4.2336MHz)
FPC : PLL frequency comparison signal
STAT : Status command for CRC etc.
DMUTE : Data mute command
MDATA : Mode control data
MLD : Load command for mode control data (Active Low)
MCLK
$\overline{SUBQ}$
$\overline{CLDCK}$
BLKCK
$\overline{RST}$
$\overline{TRON}$
EC
PC
SMCK
OE
WE
LRCK
SRDATA
SCK
MEMP

CIRCUIT



.
for LAG network
ack jumping.
aser supply and

devided by four.

ignal (Active High)

.2336MHz)
ison signal
RC etc.

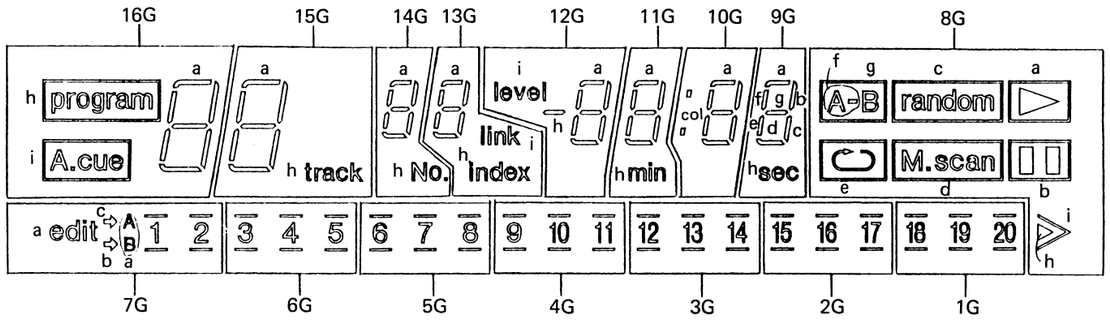
e control data

MCLK : Data clock for MDATA
$\overline{SUBQ}$: Sub-code Q data
$\overline{CLDCK}$: Data frame clock (7.35KHz)
$\overline{BLKCK}$: Sub-code Q data block clock (75 Hz)
$\overline{RST}$: Reset command (Active Low)
$\overline{TRON}$: Tracking servo ON command (Active Low)
EC : Spindle motor drive signal
$\overline{PC}$: Spindle motor ON command (Active Low)
SMCK : System clock (4.2336MHz)
$\overline{OE}$: Read out enable
$\overline{WE}$: Write enable
LRCK : L/R data discrimination clock (88.2KHz)
SRDATA : Serial data output (MSB first)
SCK : Serial bit clock (2.82MHz)
MEMP : Deemphasis command (Active High)

Note)
• ——→ Audio signal.

■ INTERNAL CONNECTION OF FL

• Grid connection diagram



• Pin connection table

42	41	40	39	38	37	36	35	34	33	32	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
F2	F2	NP	a	b	c	d	NP	NP	NP	e	f	g	h	i	16G	15G	14G	13G	NP	NP	NP	NP	12G	11G	10G	9G	8G	7G	6G	5G	4G	NP	NP	NP	NP	3G	2G	1G	NP	F1	F1

• Anode connection table

	16G	15G	14G	13G	12G	11G	10G	9G	8G	7G	6G	5G	4G	3G	2G	1G
a	a	a	a	a	a	a	a	a	▶	edit A/B	3	6	9	12	15	18
b	b	b	b	b	b	b	b	b	❚❚	⇨(down)	3	6	9	12	15	18
c	c	c	c	c	c	c	c	c	random	⇨(up)	3	6	9	12	15	18
d	d	d	d	d	d	d	d	d	M.scan	1	4	7	10	13	16	19
e	e	e	e	e	e	e	e	e	↻	(down) 1	4	7	10	13	16	19
f	f	f	f	f	f	f	f	f	A–	(up) 1	4	7	10	13	16	19
g	g	g	g	g	g	g	g	g	B	2	5	8	11	14	17	20
h	program	track	No.	index	—	min	col	sec	▶	(down) 2	5	8	11	14	17	20
i	A.cue	-	-	link	level	·	-	-	>	(up) 2	5	8	11	14	17	20

■ SCHEMATIC DIAGRAM

(Parts list on pages 41 ~ 46.)

(This schematic diagram may be modified at any time with development of new technology.)

Notes:

- **S1** : Power switch in "**on**" position.
- **S601** : Disc holder open/close (⏏ open/close) switch.
- **S602, 603** : Skip (⏮ skip/skip ⏭) switches.
  S602: ⏮ (R), S603: ⏭ (F)
- **S604** : Stop (⏸ stop) switch.
- **S605** : Pause (■ pause) switch.
- **S606** : Play (▶ play) switch.
- **S607 ~618** : Numeric (+10, 0, 1 ~ 10) switches.
  [S607: +10, S608: 0, S609: 1, S610: 2, S611: 3, S612: 4, S613: 5, S614: 6, S615: 7, S616: 8, S617: 9, S618: 10]
- **S619** : Edit tape length (tape length) switch.
- **S620** : Tape-side (side A/B) switch.
- **S621** : Disc link (disc link) switch.
- **S622** : Time mode select (time mode) switch.
- **S623** : Programmed-play (program) switch.
- **S624** : Clear (clear) switch.
- **S625** : Recall (recall) switch.
- **S626** : Repeat (repeat) switch.
- **S627** : Auto cue (auto cue) switch.
- **S628** : Random play (random) switch.
- **S629** : Music scan (music scan) switch.
- **S630, 631** : Search (◀◀ search ▶▶) switches.
  S630:◀◀(R), S631: ▶▶(F)
- **S1001** : Tray (open/close) switch.

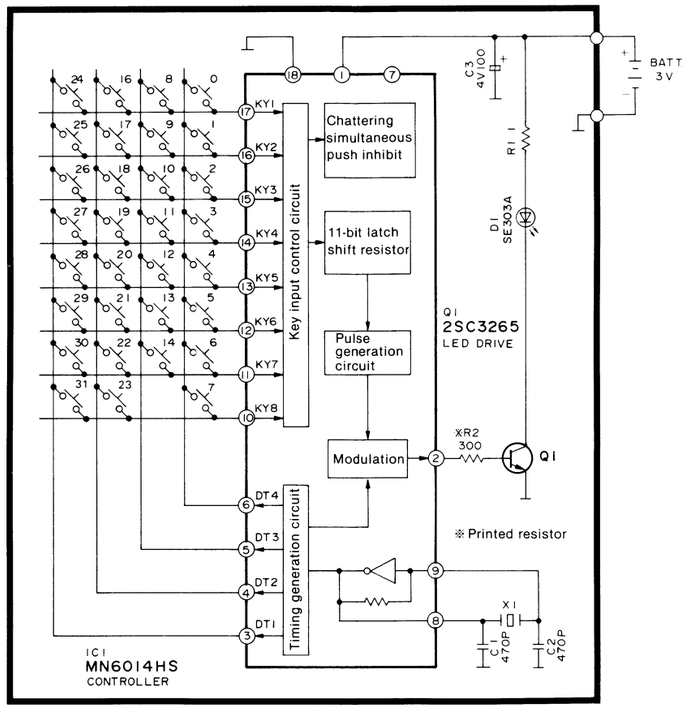
- The voltage value and waveforms are the reference voltage of this unit measured by DC electronic voltmeter (high impedance) and oscilloscope on the basis of chassis.
  Accordingly, there may arise some error in voltage values and waveforms depending upon the internal impedance of the tester or the measuring unit.
  *The parenthesized are the values of voltage generated during playing (Test disc 1kHz, L+R, 0dB), others are voltage values in stop mode.
- Important safety notice:
  Components identified by ⚠ mark have special characteristics important for safety. When replacing any of these components, use only manufacturer's specified parts.
- ─< >─/--< >--: Positive voltage lines and negative voltage lines.
  ▒▒▒ : Audio signal lines.

Caution!

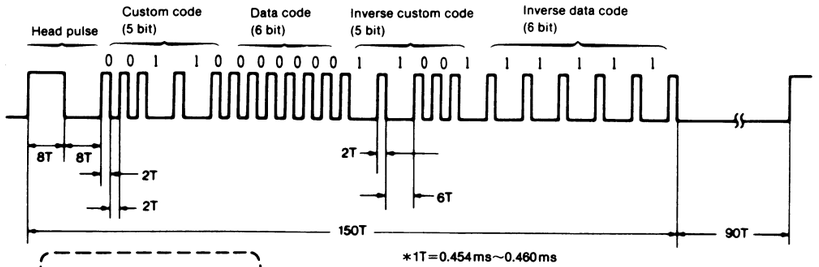
IC and LSI are sensitive to static electricity.
Secondary trouble can be prevented by taking care during repair.

- Cover the parts boxes made of plastics with aluminum foil.
- Ground the soldering iron.
- Put a conductive mat on the work table.
- Do not touch the pins of IC or LSI with fingers directly.

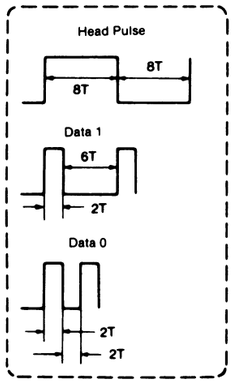
• Remote control transmitter



• Key number description and data code



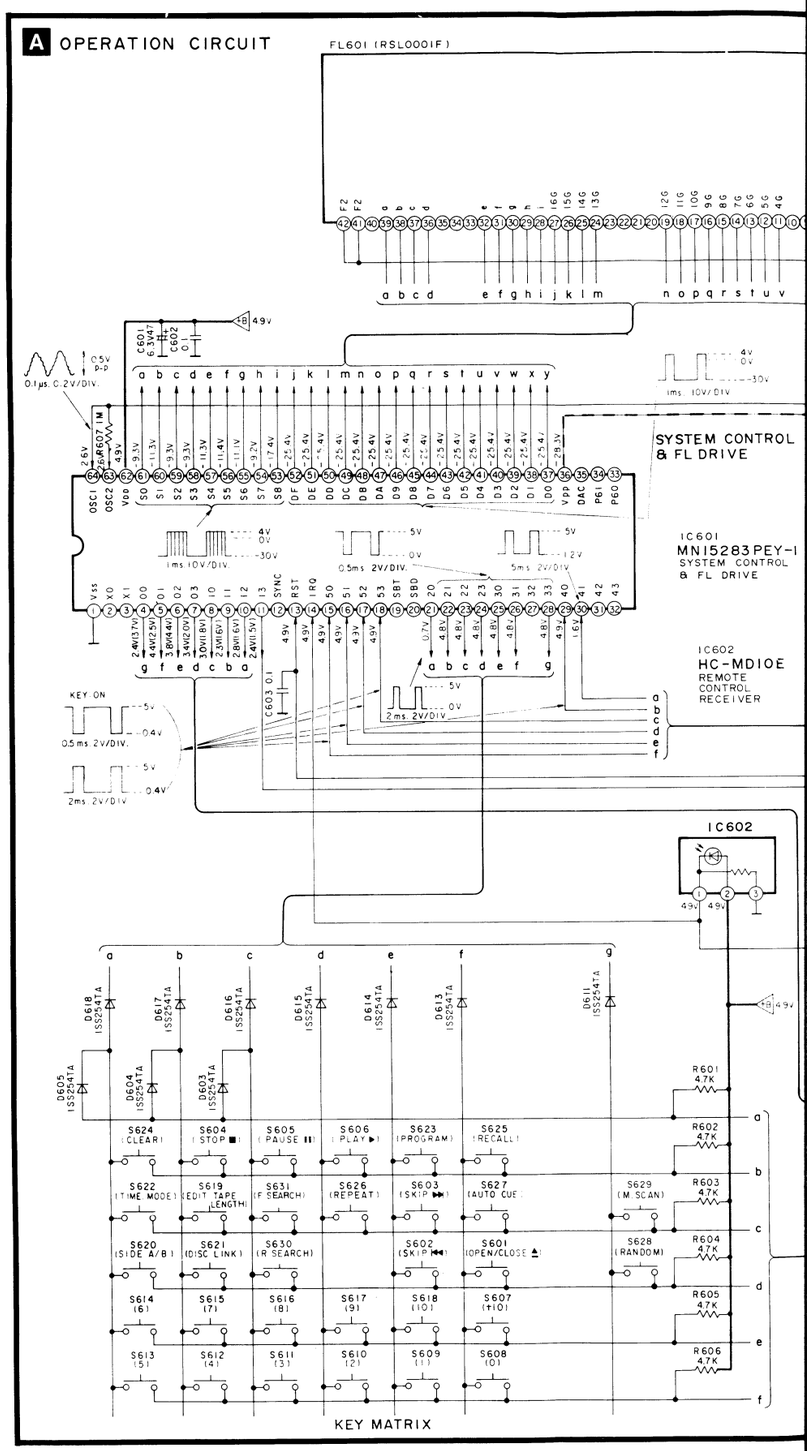
*1T=0.454ms~0.460ms



Key No.	Function	Data code	Key No.	Function	Data code
0	▶ play	001010	17	search ▶▶	000101
1	skip ▶▶I	000011	18	2	010001
2	4	010011	19	6	010101
3	8	010111	20	10	110000
4	0	011001	21	clear	001011
5	time mode	101001	22	repeat	000111
6	music scan	001111	23	level ▲	100100
7	auto cue	100011	24	▲ open/close	001110
8	▮▮ pause	000110	25	◀◀ search	000100
9	I◀◀ skip	000010	26	1	010000
10	3	010010	27	5	010100
11	7	010110	28	9	011000
12	+10	011010	29	program	011101
13	recall	001001	30	A-B repeat	001000
14	random	011111	31	▼ level	100101
16	■ stop	000000			

※Custom code: 01100

A OPERATION CIRCUIT



7 8 9 10 11 12 13 14 15 16

B SERVO CIRCUIT

OPTICAL PICKUP
FOCUS COIL
RADIAL MOTOR
LASER
0.047
1K
1μH

Q6502
BC338
LASER AMP

Laser power adj.

Play 150mVp-p 5ms 50mV/DIV.

IC6504 (1/2)

Q6502

Q6507
BC848C
DETECTOR

Focus offset adj.

IC6504
TCA0372DP2
FOCUS/RADIAL DRIVE

IC6501
TDA8808T/C3
PHOTO DIODE SIGNAL PROCESSOR

IC6503
TDA8809T/C2
RADIAL ERROR SIGNAL PROCESSOR

32 TURNTABLE MOTOR

S1001

SYSTEM CONTROL & FL DRIVE

IC601
MN15283PEY-I
SYSTEM CONTROL & FL DRIVE

IC602
HC-MDIOE
REMOTE CONTROL RECEIVER

CN602
CN603
CN604

L601

S623 (PROGRAM)
S625 (RECALL)
S603 (SKIP ⏭)
S627 (AUTO CUE)
S629 (M.SCAN)
S602 (SKIP ⏮)
S601 (OPEN/CLOSE ⏏)
S628 (RANDOM)
S618 (10)
S607 (+10)
S609 (1)
S608 (0)

D613 1SS244TA
D611 1SS244TA

TRIX

C

MAIN CIRCUIT

LOADING MOTOR DRIVE

DATA SLICE AND PLL

TURNTABLE MOTOR DRIVE

PERIOD DET & SPEED CONTROL

RESET SIGNAL GENERATOR

SYSTEM CONTROL

DIGITAL SIGNAL PROCESSING

LOADING MOTOR

IC501 AN8371S DATA SLICE & PLL

IC402 (1/2) BA4558FTI MOTOR DRIVE

Q352,431 2SD1862QRTV6 MOTOR DRIVE

Q353,432 2SB1240QRTV6 MOTOR DRIVE

Q351 DTA124EST MOTOR CONTROL

IC401 MN1554PJE-2 SYSTEM CONTROL

IC404(1/4) IC404 (1/4) MN74HC00S NAND GATE

IC403 MN1551PJF-1 PERIOD DET. & SPEED CONTROL

IC13 BA4558FTI RESET

Q51 DTC124EST RESET

IC302 SVICXK5816M 16K RAM

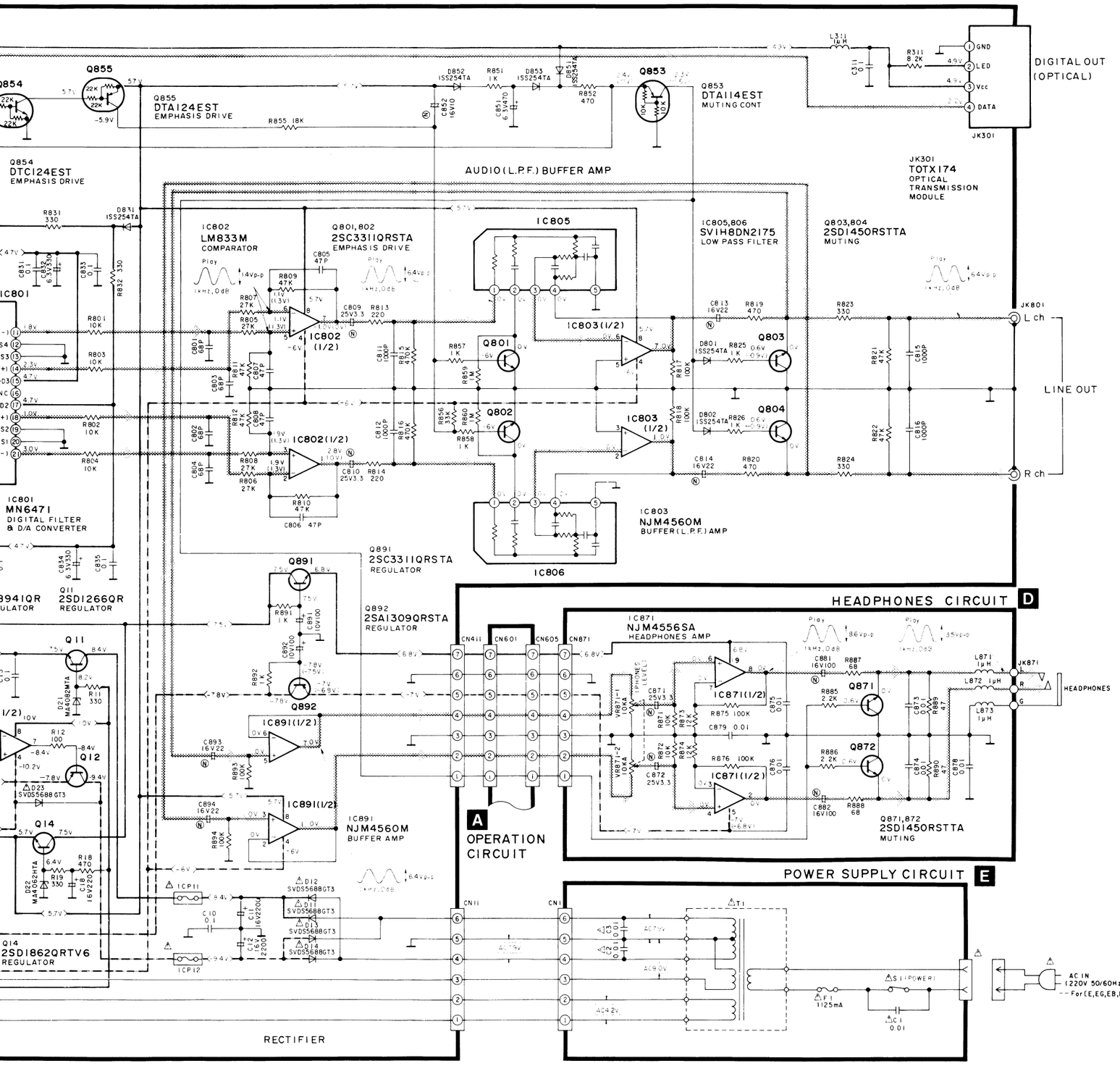
IC301 MN6625 DIGITAL SIGNAL PROCESSING

Q16 2SB1238QSTV6 REGULATOR

Q13,15 2SB1240Q REGULATOR

IC501
IC302 SVI CXK5816M 16K RAM
IC301 MN6625 DIGITAL SIGNAL PROCESSING
DIGITAL SIGNAL PROCESSING
IC401
TEM CONTROL
DIGITAL FILTER & D/A CONVERTER
IC801 MN6471 DIGITAL FILTER & D/A CONVERTER
IC11 LM2940T5 REGULATOR
Q12 2SB941QR REGULATOR
Q11 2SD1266QR REGULATOR
IC12 BA4558FTI STABILIZER
IC13 BA4558FTI STABILIZER
Q13,15 2SB1240QRTV6 REGULATOR
Q14 2SD1862QRTV6 REGULATOR
Q16 2SB1238QSTV6 REGULATOR
REGULATOR
Q851 DTAI24EST MUTING CONT.
Q852 DTCI24EST MUTING CONT.
Q854 DTCI24EST EMPHASIS DRIVE
Q855 DTAI24EST EMPHASIS DRIVE
Q853 DTAI14EST MUTING CONT
AUDIO(L.P.F.) BUFFER AMP
IC802 LM833M COMPARATOR
Q801,802 2SC3311QRSTA EMPHASIS DRIVE
IC802 (1/2)
IC803(1/2)
IC802(1/2)
IC805
IC805,806 SVIH8DN2175 LOW PASS FILTER
IC803 NJM4560M BUFFER(L.P.F.)AMP
IC806
Q891 2SC3311QRSTA REGULATOR
Q892 2SAI309QRSTA REGULATOR
IC871 NJM4556SA HEADPHONES AMP
IC871(1/2)
IC891(1/2)
IC891 NJM4560M BUFFER AMP
A OPERATION CIRCUIT
RECTIFIER
POWE

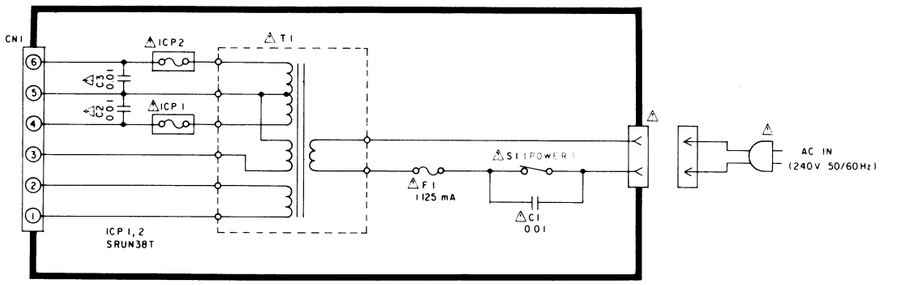
29 30 31 32 33 34 35 36 37 38



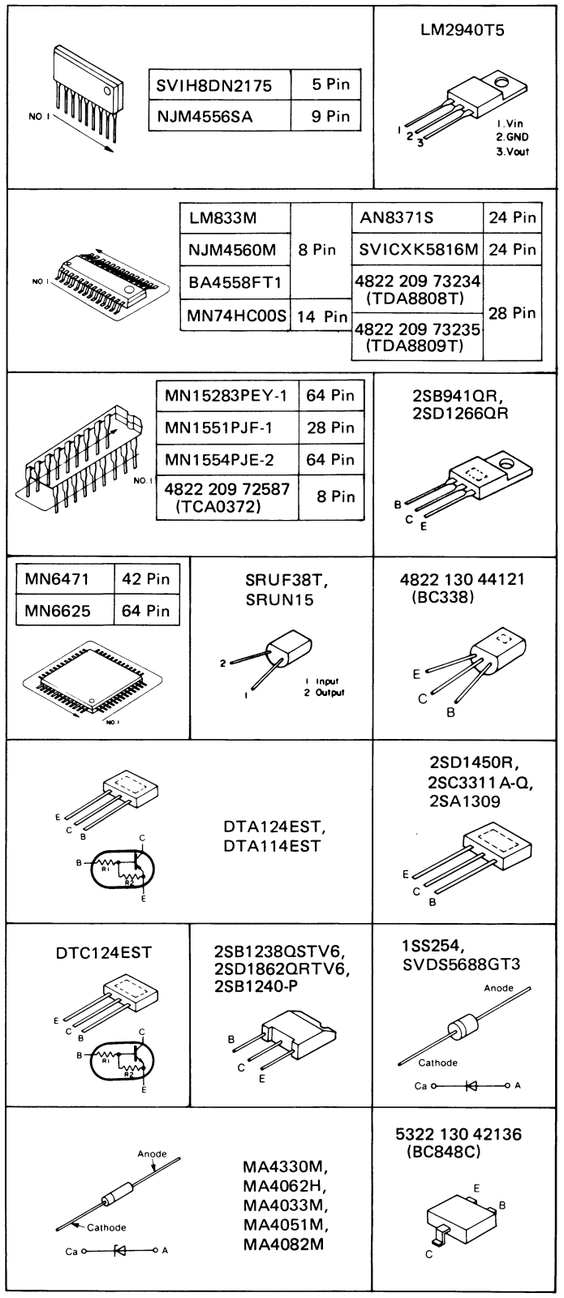
- Power supply circuit for [EK] area.

For (EK) area.

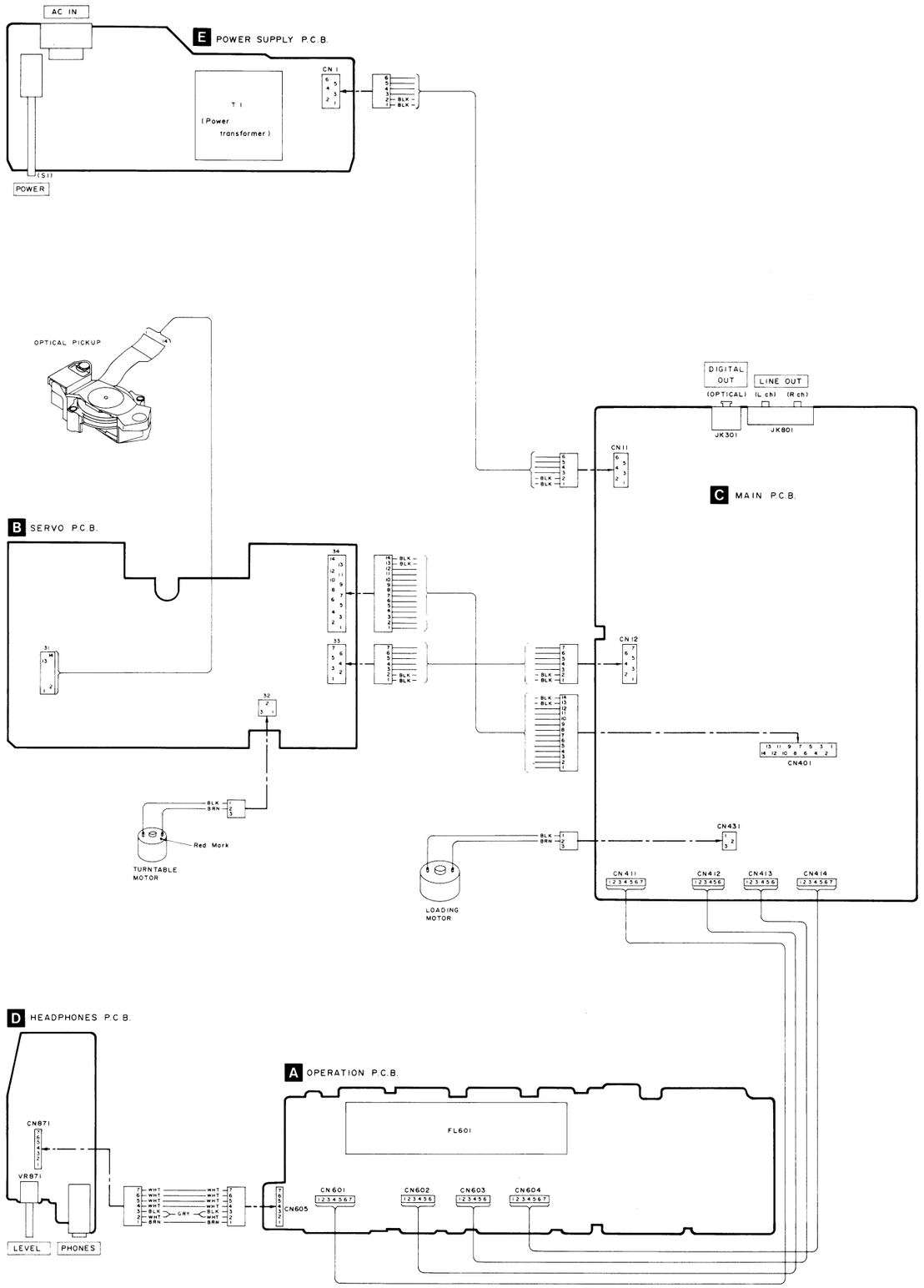
E POWER SUPPLY CIRCUIT



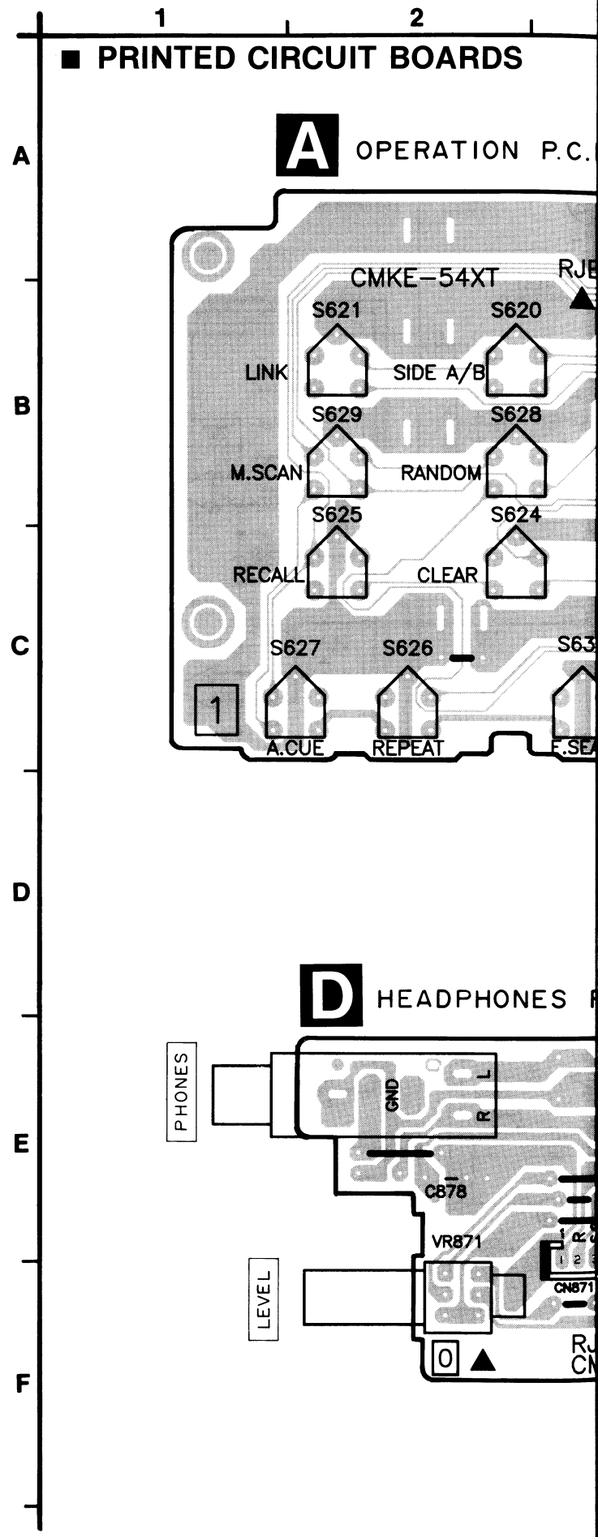
■ TERMINAL GUIDE OF IC's, TRANSISTORS AND DIODES



■ WIRING CONNECTION DIAGRAM

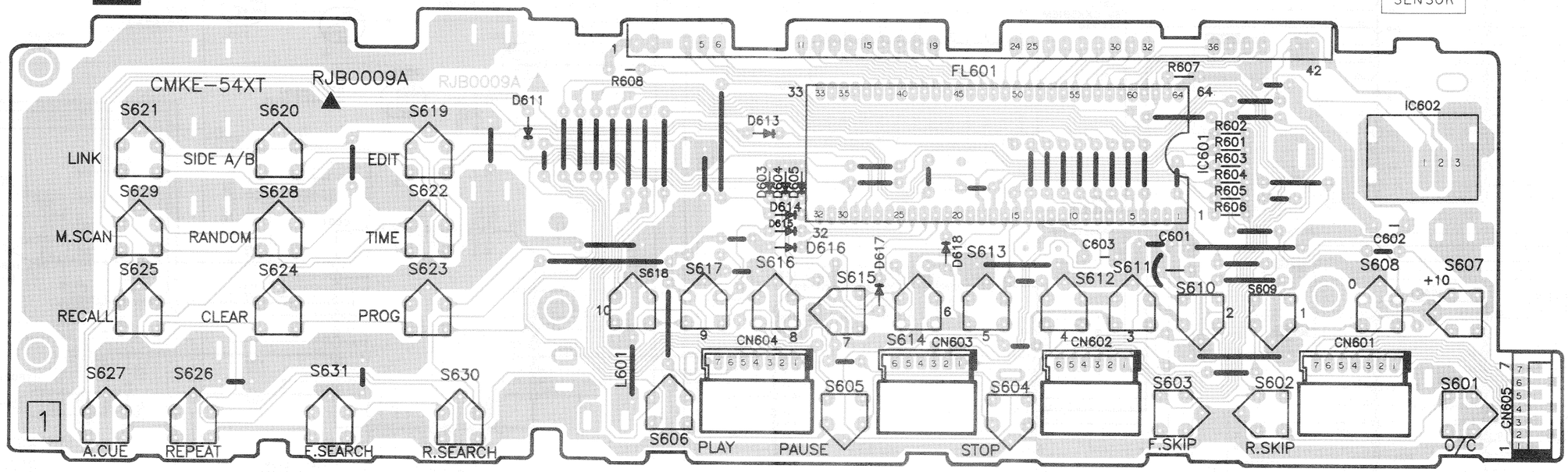


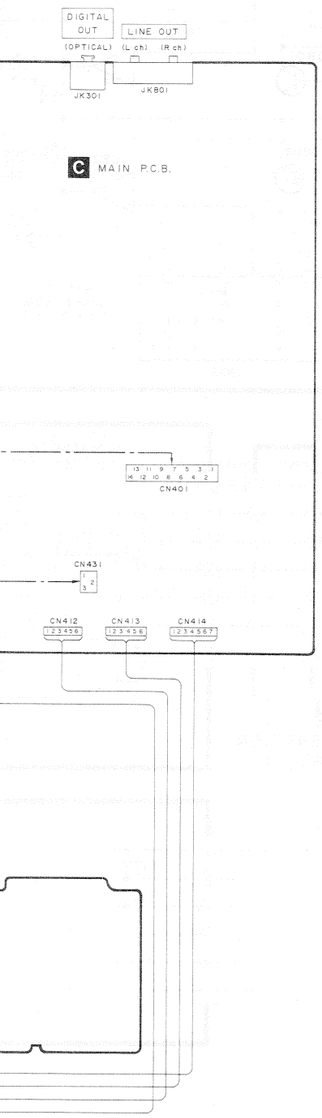
■ PRINTED CIRCUIT BOARDS



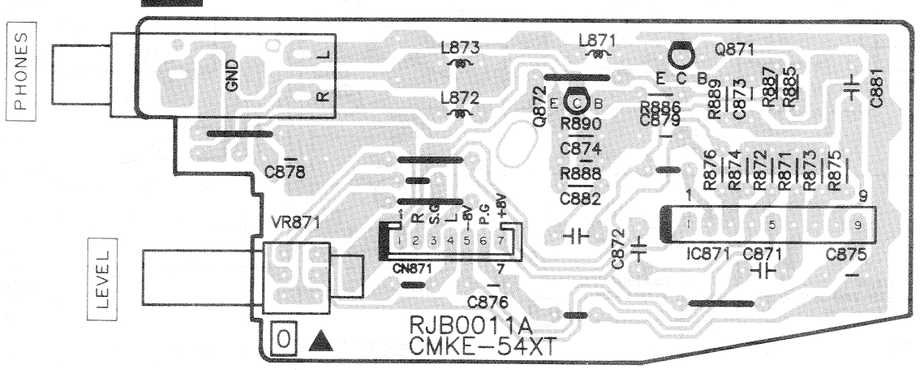
■ PRINTED CIRCUIT BOARDS

A OPERATION P.C.B.

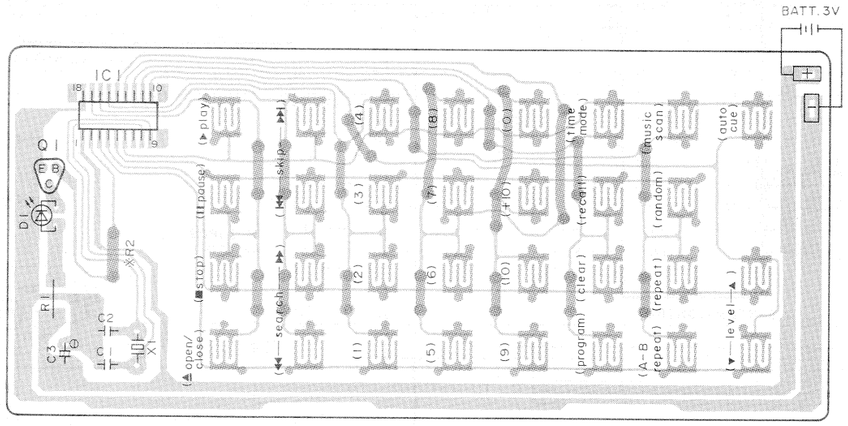




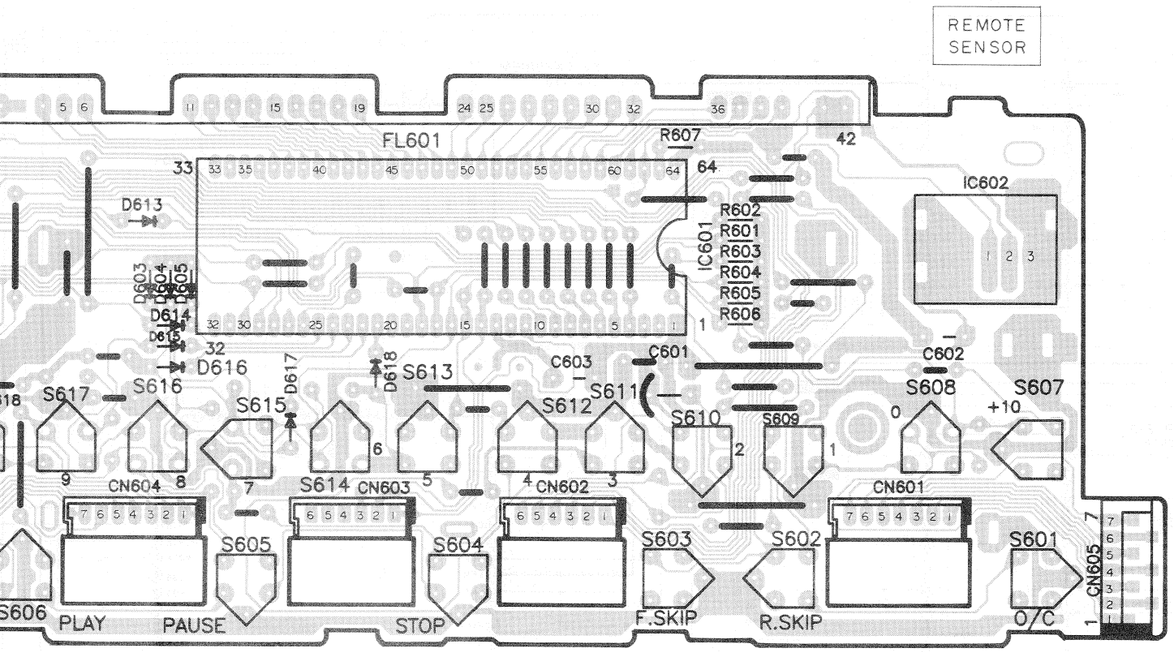
D HEADPHONES P.C.B.



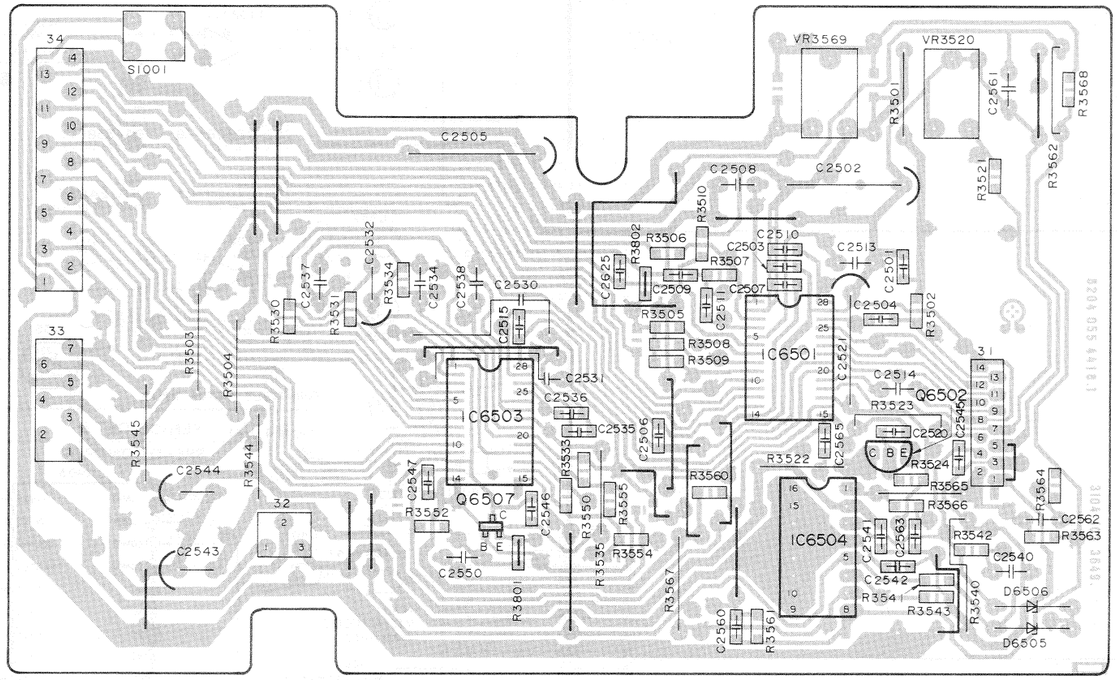
• Remote control transmitter



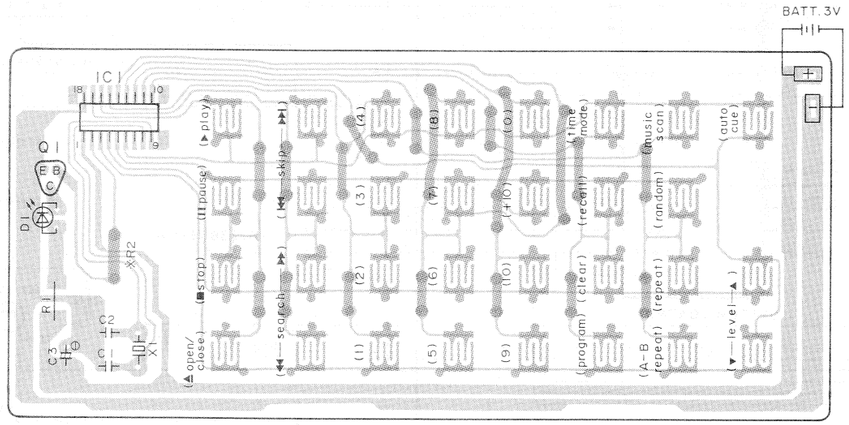
SL-P222A

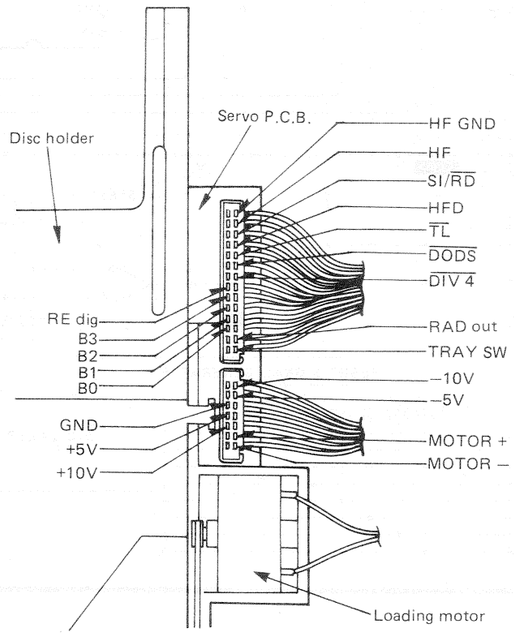


B SERVO P.C.B.



• Remote control transmitter



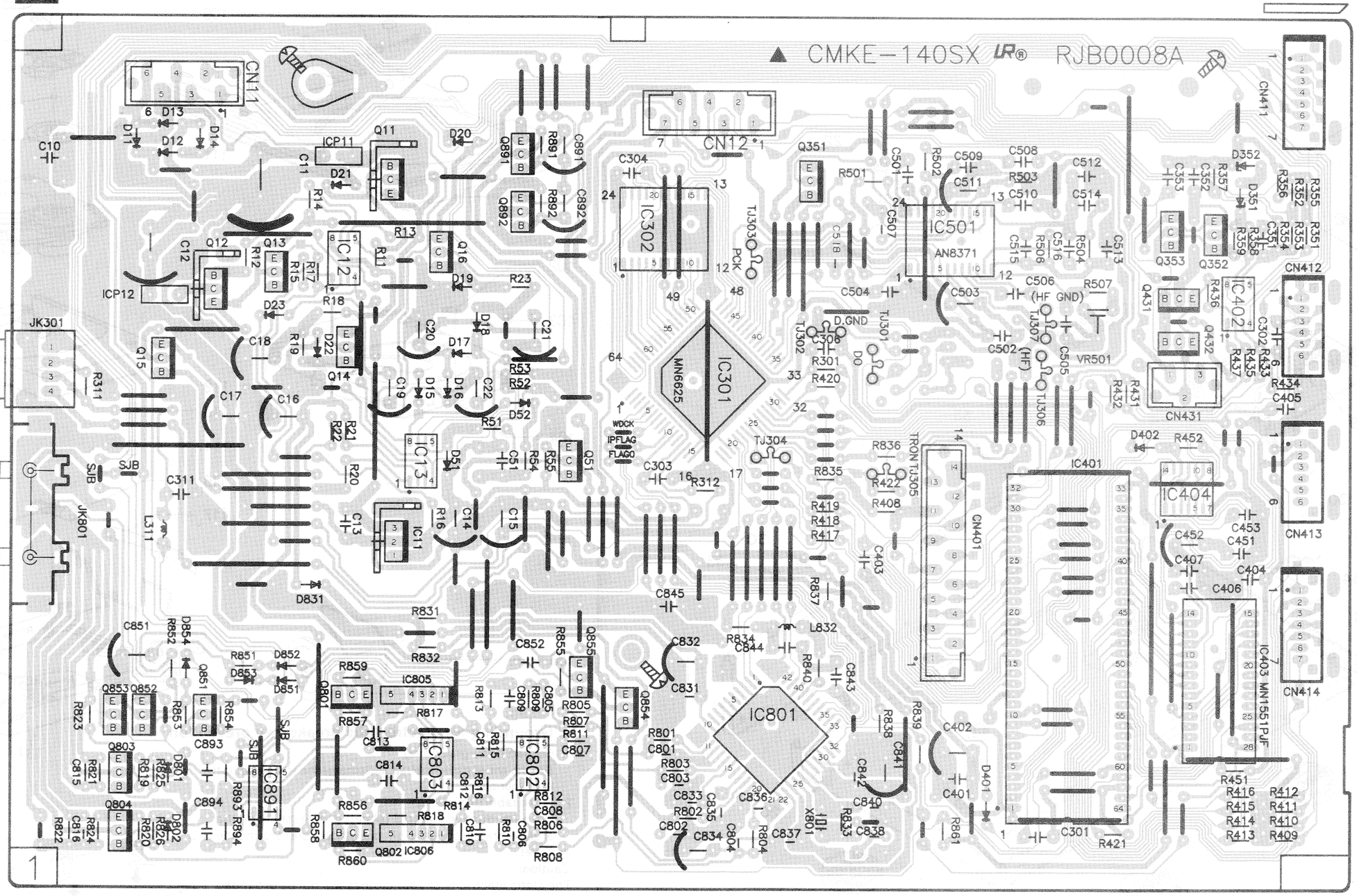


Note: Use connector pins to check servo circuit voltages and waveforms.

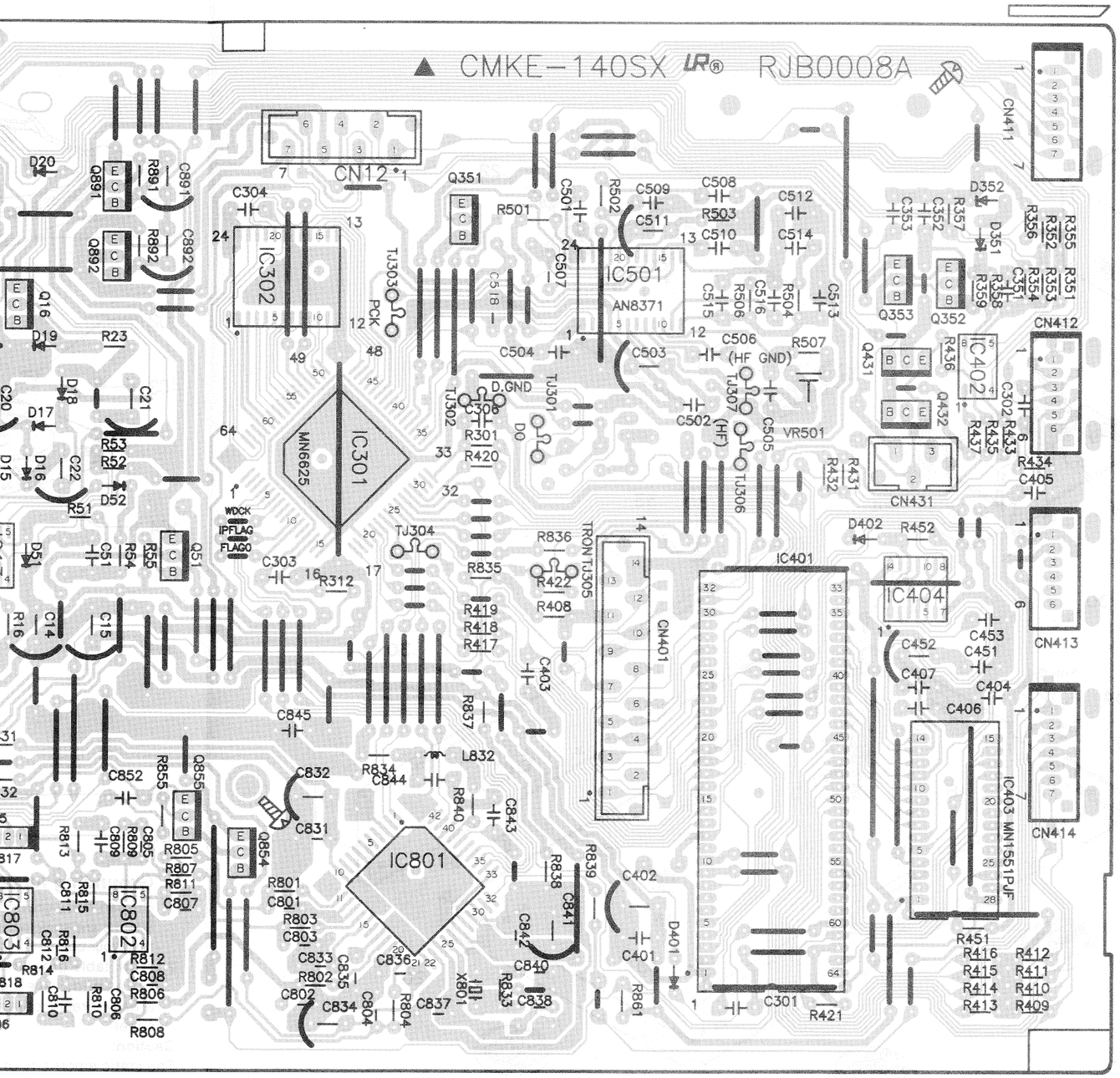
15 16 17 18 19 20 21 22 23 24

C MAIN P.C.B.

▲ CMKE-140SX UR® RJB0008A



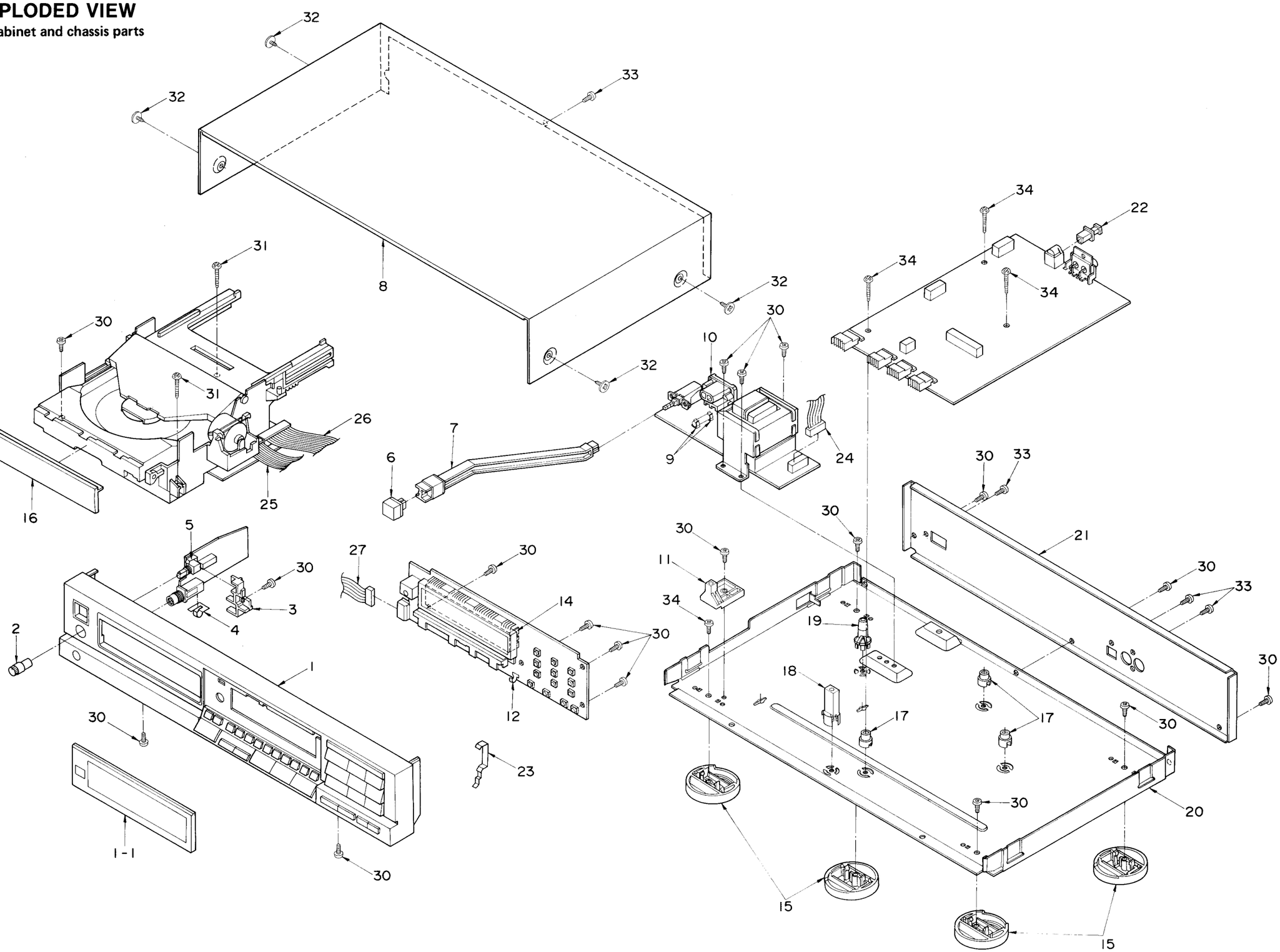
19 20 21 22 23 24 25 26 27 28



SL-P222A SL-P222A

■ EXPLODED VIEW

• Cabinet and chassis parts



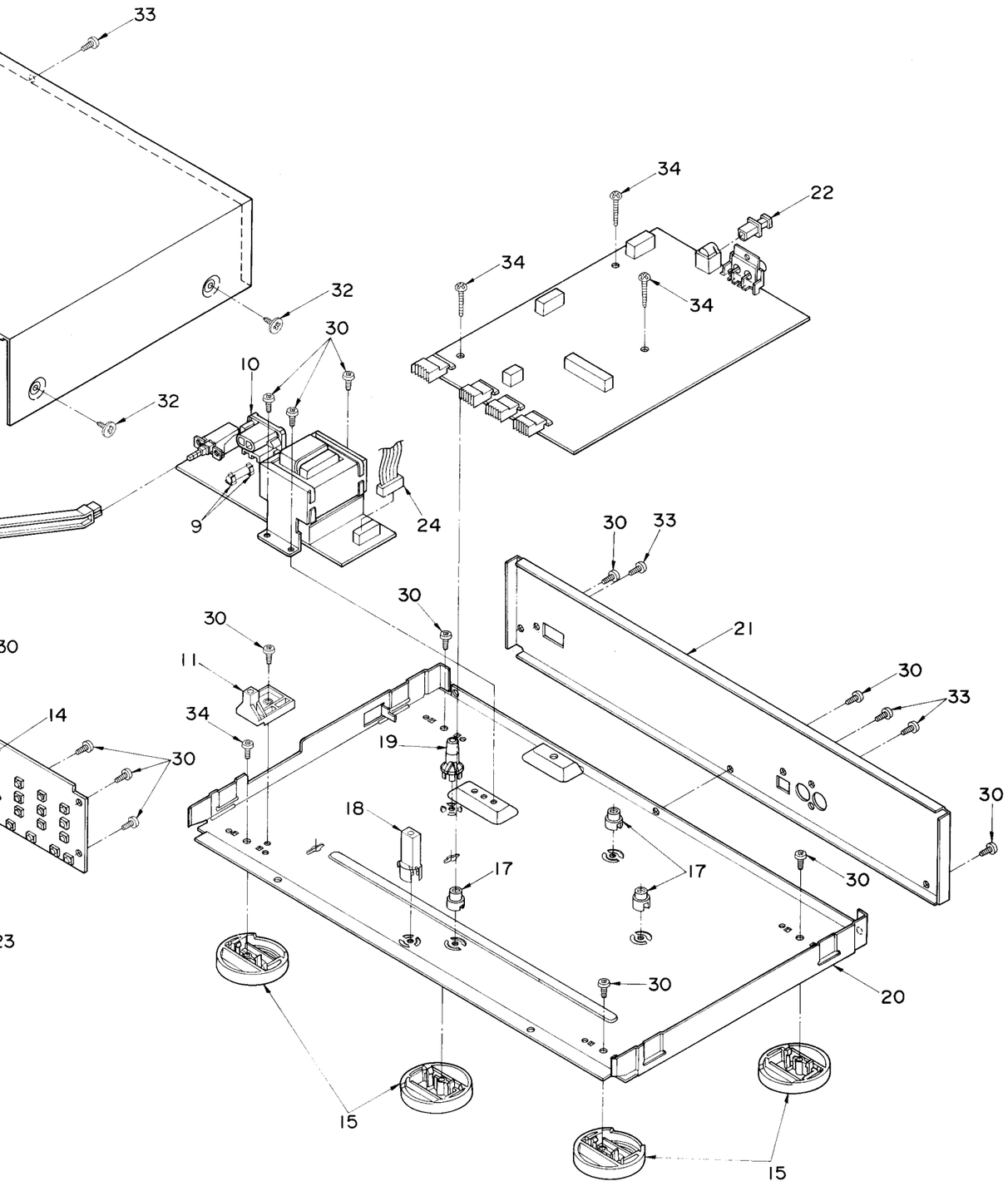
• Loading unit part

• **Grounding for el**

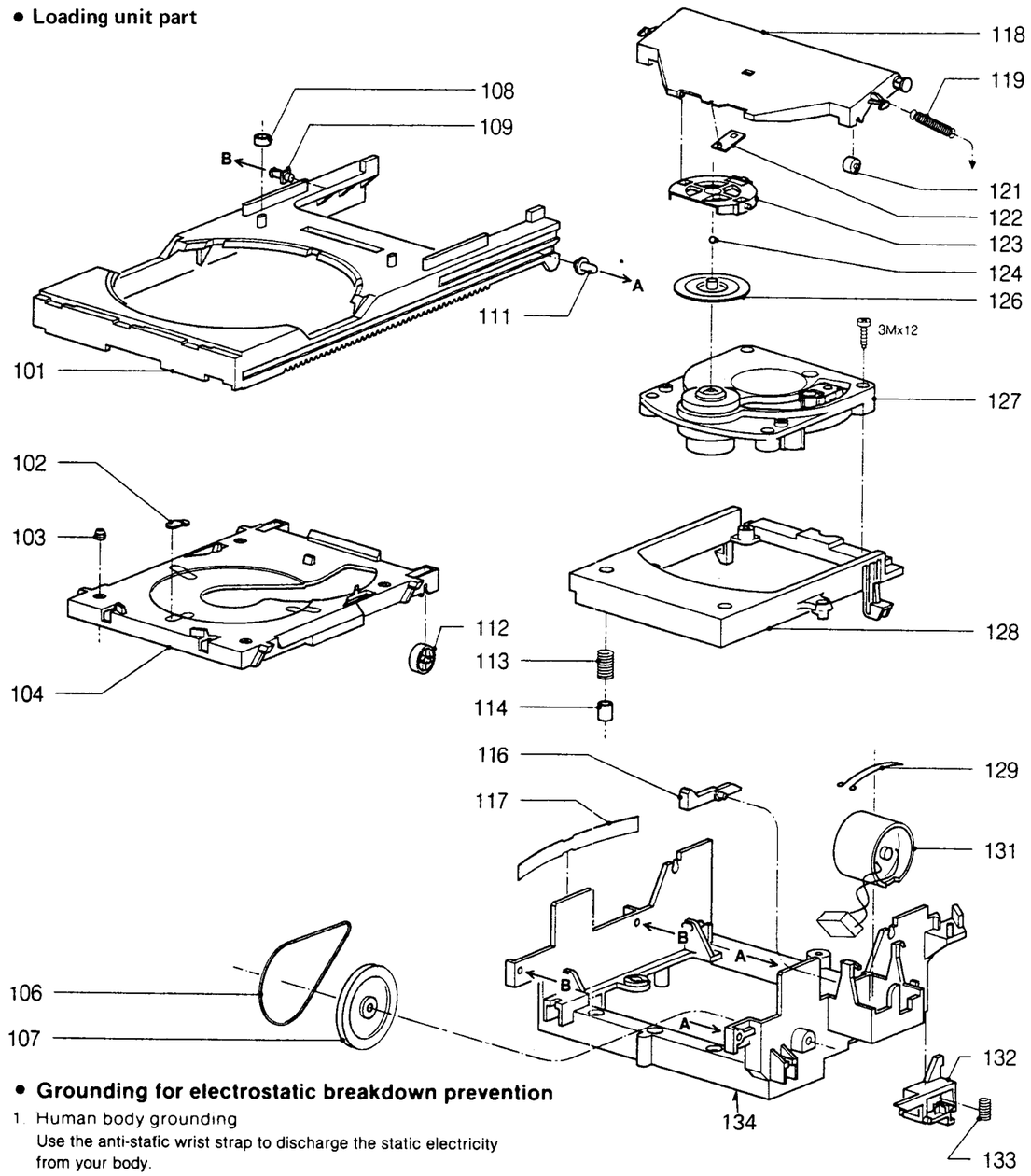
1. Human body ground
   Use the anti-static wrist
   from your body.
2. Work table groundin
   Put a conductive ma
   area where the optica
   sheet.

Caution:

The static electricity of
through the wrist stra
clothes touch the optic



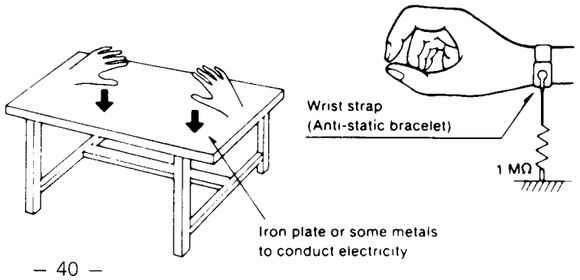
• **Loading unit part**



• **Grounding for electrostatic breakdown prevention**

1. Human body grounding
   Use the anti-static wrist strap to discharge the static electricity from your body.
2. Work table grounding
   Put a conductive material (sheet) or steel sheet on the area where the optical pickup is placed, and ground the sheet.

Caution:
The static electricity of your clothes will not be grounded through the wrist strap. So, take care not to let your clothes touch the optical pickup.



■ REPLACEMENT PARTS LIST

Notes : * Important safety notice :
Components identified by ⚠ mark have special characteristics important for safety. When replacing any of these components use only manufacturer's specified parts.
* Bracketed indications in Ref. No. columns specify the area. (Refer to the first page for area.)
Parts without these indications can be used for all areas.
* "Ⓚ" mark parts are used for black type only.
* "Ⓢ" mark parts are used for silver type only.
Parts other than "Ⓚ" and "Ⓢ" marked are used for all color types
* Warning : This product uses a laser diode. Refer to caution statements on page 3.
* ACHTUNG :
Die lasereinheit nicht zerlegen.
Die lasereinheit darf nur gegen eine vom hersteller spezifizierte einheit ausgetauscht werden.
* Remote control ass'y : Supply period for three years from termination of production.
* MB indicates parts that are supplied by **MBV**.

Ref. No.		Part No.	Description	
CABINET AND CHASSIS				
1	Ⓚ	SYYD222KEE	FRONT PANEL ASS'Y	
1	Ⓢ	SYYD222SEE	FRONT PANEL ASS'Y	
1-1		SGUD224	ORNAMENT	
2	Ⓚ	SBN1161-2	KNOB	
2	Ⓢ	SBN1161-3	KNOB	
3		SHRD201	PLATE	
4		SUSD165	SPRING	
5		SUSD141	COIL SPRING	
6	Ⓚ	SBC666-1	BUTTON	
6	Ⓢ	SBC666	BUTTON, POWER	
7		SUBD15-1	ROD	
8	Ⓚ	RKM0011-K	CABINET	MB
8	Ⓢ	RKM0011-S	CABINET	MB
9		SJT390	FUSE HOLDER	
10	⚠	SJS9236	AC INLET	
11		RMR0022	HOLDER	MB
12		SUSD144	EARTH PLATE	
14		SUWD139	BRACKET	
15		SKLD8-E	FOOT	
16	Ⓚ	RGK0015	ORNAMENT	
16	Ⓢ	RGK0015A	ORNAMENT	
17		SHE186-2	HOLDER	
18		RMR0021	HOLDER	MB
19		RMR0020	HOLDER	MB
20		SKULP212A-KE	BOTTOM BOARD	MB
21 (EB, EH, EF) (EI)		SGPLP222A-KB	REAR PANEL	MB
21 (E)		SGPLP222A-KE	REAR PANEL	MB
21 (EG)		SGPLP222A-KG	REAR PANEL	MB
21 (EK)		SGPLP222A-KK	REAR PANEL	MB
22		VJA1024	CAP	
23	Ⓢ	RMC0013	BRACKET	MB
24		REX0006	CONNECTOR	MB
25		REX0007	CONNECTOR	MB
26		REX0008	CONNECTOR	MB
27		SWKD552071-1	CORD	
30		XTB3+8JFZ	SCREW	
31		XTB3+35JFZ	SCREW	
32	Ⓚ	SNE2129-1	SCREW	
32	Ⓢ	SNE2129	SCREW	
33		XTBS3+8JFZ1	SCREW	
34		XTB3+16JFZ	SCREW	

Ref. No.	Part No.	Description	
LOADING UNIT PARTS			
101	4822 444 50603	TRAY	MB
102	4822 325 50176	GROMMET, CABLE	MB
103	4822 325 50177	GROMMET, CABLE	MB
104	4822 466 92251	PLATE	MB
106	4822 358 10115	BELT, DRIVING	MB
107	4822 522 32359	WHEEL, GEAR	MB
108	4822 532 51518	RING, RUBBER	MB
109	4822 402 61081	GUIDE	MB
111	4822 402 61132	GUIDE	MB
112	4822 528 90638	ROLLER	MB
113	4822 492 51902	SPRING, COMPRES.	MB
114	4822 466 61587	FOAM	MB
116	4822 402 61107	LEVER	MB
117	4822 492 63659	SPRING, BLADE	MB
118	4822 444 60568	LID	MB
119	4822 492 32883	SPRING, TENSION	MB
121	4822 528 90639	ROLLER	MB
122	4822 466 92257	PLATE	MB
123	4822 402 61207	HOLDER	MB
124	4822 520 40177	BALL	MB
126	4822 530 80503	RING, PRESSURE	MB
127	4822 691 30209	Optical pickup unit	MB
128	4822 402 61196	SUPPORT	MB
129	4822 492 63746	SPRING, CLAMPING	MB
131	4822 361 20998	MOTOR	MB
132	4822 402 50244	BRACKET	MB
133	4822 492 51935	SPRING, COMPRES.	MB
134	4822 464 50715	CHASSIS	MB

Ref. No.	Part No.	Description
INTEGRATED CIRCUITS		
IC11	LM2940T5	I.C. REGULATOR
IC12	SVIBA4558F	I.C. STABILIZER
IC13	SVIBA4558F	I.C. RESET
IC301	MN6625	IC. DIGITAL SIGNAL PROCESSOR
IC302	SVICXK5816M	I.C. 16K RAM
IC401	MN1554PJE-2	I.C. SYSTEM CONTROL
IC402	SVIBA4558F	I.C. MOTOR DRIVE
IC403	MN1551PJF-1	I.C. PERIOD DET/SPEED CONT
IC404	MN74HC00S	I.C. NAND GATE
IC501	AN8371S	I.C. DATA SLICE&PLL
IC601	MN15283PEY-1	I.C. SYSTEM CONTROL/FL DRIVE
IC602	HC-MD10E	I.C. REMOTE CONTROL
IC801	MN6471	I.C. DIGITAL FILTER
IC802	LM833M	I.C. COMPARATOR
IC803	NJM4560M	I.C. BUFFER(L.P.F.)
IC805	SVIH8DN2175	I.C. LOW PASS FILTER
IC806	SVIH8DN2175	I.C. LOW PASS FILTER
IC871	NJM4556SA	I.C. HEADPHONES
IC891	NJM4560M	I.C. BUFFER
TRANSISTORS		
Q11	2SD1266QR	TRANSISTOR, REGULATOR
Q12	2SB941QR	TRANSISTOR, REGULATOR
Q13	2SB1240-P	TRANSISTOR, REGULATOR
Q14	2SD1862QRTV6	TRANSISTOR, REGULATOR
Q15	2SB1240-P	TRANSISTOR, REGULATOR
Q16	2SB1238QSTV6	TRANSISTOR, REGULATOR
Q51	DTC124EST	TRANSISTOR, RESET
Q351	DTA124EST	TRANSISTOR, MOTOR CONTROL
Q352	2SD1862QRTV6	TRANSISTOR, MOTOR DRIVE
Q353	2SB1240-P	TRANSISTOR, MOTOR DRIVE
Q431	2SD1862QRTV6	TRANSISTOR, MOTOR DRIVE
Q432	2SB1240-P	TRANSISTOR, MOTOR DRIVE
Q801	2SC3311A-Q	TRANSISTOR, EMPHASIS DRIVE
Q802	2SC3311A-Q	TRANSISTOR, EMPHASIS DRIVE
Q803	2SD1450R	TRANSISTOR, MUTING
Q804	2SD1450R	TRANSISTOR, MUTING
Q851	DTA124EST	TRANSISTOR, MUTING CONT.
Q852	DTC124EST	TRANSISTOR, MUTING CONT.
Q853	DTA114EST	TRANSISTOR, MUTING CONT.
Q854	DTC124EST	TRANSISTOR, EMPHASIS DIVE
Q855	DTA124EST	TRANSISTOR, EMPHASIS DRIVE
Q871	2SD1450R	TRANSISTOR, MUTING
Q872	2SD1450R	TRANSISTOR, MUTING
Q891	2SC3311A-Q	TRANSISTOR, REGULATOR
Q892	2SA1309A-R	TRANSISTOR, REGULATOR
DIODES		
D11 ⚠	SVDS5688GT3	DIODE
D12 ⚠	SVDS5688GT3	DIODE
D13 ⚠	SVDS5688GT3	DIODE
D14 ⚠	SVDS5688GT3	DIODE
D15 ⚠	SVDS5688GT3	DIODE
D16 ⚠	SVDS5688GT3	DIODE
D17 ⚠	SVDS5688GT3	DIODE
D18 ⚠	SVDS5688GT3	DIODE
D19	MA4330M	DIODE
D20	MA4062-H	DIODE
D21	MA4082	DIODE
D22	MA4062-H	DIODE
D23 ⚠	SVDS5688GT3	DIODE

Ref. No.	Part No.	Description
D51	MA4033M	DIODE
D52	MA165	DIODE
D351	MA4051-M	DIODE
D352	MA4051-M	DIODE
D401	MA165	DIODE
D402	MA165	DIODE
D603	MA165	DIODE
D604	MA165	DIODE
D605	MA165	DIODE
D611	MA165	DIODE
D613	MA165	DIODE
D614	MA165	DIODE
D615	MA165	DIODE
D616	MA165	DIODE
D617	MA165	DIODE
D618	MA165	DIODE
D801	MA165	DIODE
D802	MA165	DIODE
D831	MA165	DIODE
D851	MA165	DIODE
D852	MA165	DIODE
D853	MA165	DIODE
D854	MA165	DIODE
I.C.PROTECTORS		
ICP1 ⚠ (EK)	SRUN38T	I.C.PROTECTOR
ICP2 ⚠ (EK)	SRUN38T	I.C.PROTECTOR
ICP11 ⚠	SRUN15	I.C.PROTECTOR
ICP12 ⚠	SRUN15	I.C.PROTECTOR
VARIABLE RESISTORS		
VR501	EVND8AA02B13	V.R. PLL ADJ.
VR871	EVU57A022A14	V.R. HEADPHONES
COILS AND TRANSFORMERS		
L311	ELEPK1R0KA	COIL
L601	VLP0053	COIL
L832	ELEPK4R7KA	COIL
L871	ELEPK1R0KA	COIL
L872	ELEPK1R0KA	COIL
L873	ELEPK1R0KA	COIL
T1 ⚠ (EK)	RTP1V4B002-J	POWER TRANSFOMER M8
T1 ⚠ (E, EG, EB, EF) (EH, EI)	RTP1V4E001-J	POWER TRANSFORMER M8
OSCILLATORS		
X801	SVQ49U338S	OSCILLATOR
DISPLAYS		
FL601	RSL0001F	DISPLAY
FUSES		
F1 ⚠	XBA2C012TB0S	FUSE(250V,T125mA)
SWITCHES		
S1 ⚠	ESB8249V	SW. POWER
S601	EVQQS705G	SW. OPEN/CLOSE
S602	EVQQS705G	SW. SKIP
S603	EVQQS705G	SW. SKIP
S604	EVQQS705G	SW. STOP

Ref. No.	Part No.	Description
S605	EVQQS705G	SW, PAUSE
S606	EVQQS705G	SW, PLAY
S607	EVQQS705G	SW, +10
S608	EVQQS705G	SW, NO 0
S609	EVQQS705G	SW, NO 1
S610	EVQQS705G	SW, NO 2
S611	EVQQS705G	SW, NO 3
S612	EVQQS705G	SW, NO 4
S613	EVQQS705G	SW, NO 5
S614	EVQQS705G	SW, NO 6
S615	EVQQS705G	SW, NO 7
S616	EVQQS705G	SW, NO 8
S617	EVQQS705G	SW, NO 9
S618	EVQQS705G	SW, NO10
S619	EVQQS705G	SW, EDIT
S620	EVQQS705G	SW, SIDE A/B
S621	EVQQS705G	SW, DISC LINK
S622	EVQQS705G	SW, TIME MODE
S623	EVQQS705G	SW, PROGRAM
S624	EVQQS705G	SW, CLEAR
S625	EVQQS705G	SW, RECALL
S626	EVQQS705G	SW, REPEAT
S627	EVQQS705G	SW, AUTO CUE
S628	EVQQS705G	SW, RANDOM
S629	EVQQS705G	SW, M.SCAN
S630	EVQQS705G	SW, R.SEARCH
S631	EVQQS705G	SW, F.SEARCH
JACKS		
JK301	T0TX174	I.C, OPTICAL TRANSMISSION MODULE
JK801	SJFD4	OUTPUT TERMINAL
JK871	SJJ146B	JACK, HEADPHONES
OTHERS		
CN1	RJT001H006	CONNECTOR MB
CN11	RJT001H006	CONNECTOR MB
CN12	RJT001H007	CONNECTOR MB
CN401	RJT001H014	CONNECTOR MB
CN411	SJS50780WL	CONNECTOR(7P)
CN412	SJS50680WL	SOCKET(6P)
CN413	SJS50680WL	SOCKET(6P)
CN414	SJS50780WL	CONNECTOR(7P)
CN431	RJT001H003	CONNECTOR MB
CN601	SJT30747WL	CONNECTOR(7P)
CN602	SJT30647WL	CONNECTOR(6P)
CN603	SJT30647WL	CONNECTOR(6P)
CN604	SJT30747WL	CONNECTOR(7P)
CN605	EMCS0750ZL	CONNECTOR(7P)
CN871	EMCS0750Z	CONNECTOR(7P)

Ref. No.	Part No.	Description
INTEGRATED CIRCUITS		
IC6501	4822 209 73234	I.C, PHOTO DIODE SIGNAL PROCESSOR MB
IC6503	4822 209 73235	I.C, RADIAL ERROR SIGNAL PROCESSOR MB
IC6504	4822 209 72587	I.C, FOCUS/RADIAL DRIVE MB
TRANSISTORS		
Q6502	4822 130 44121	TRANSISTOR MB
Q6507	5322 130 42136	TRANSISTOR MB
DIODES		
D6505	4822 130 81101	DIODE MB
D6506	4822 130 81101	DIODE MB
VARIABLE RESISTORS		
VR3520	4822 101 10685	V.R, LASER POWER ADJ. MB
VR3569	4822 100 20522	V.R, FOCUS OFFSET ADJ. MB
SWITCH		
S1001	4822 276 12523	SW, TRAY MB

Ref. No.	Part No.	Description
PACKING MATERIAL		
P1 Ⓚ	RPG0010	CARTON BOX MB
P1 Ⓢ	RPG0076	CARTON BOX MB
P2	RPN0045A	PAD MB
P3	RPN0045B	PAD MB
P4	XZB60X60A01	PROTECTION BAG (UNIT)
ACCESSORIES		
A1 (EK)	RQT0012B	INSTRUCTION MANUAL MB
A1 (EG)	RQT0012D	INSTRUCTION MANUAL MB
A1 (E, EH)	RQT0012E	INSTRUCTION MANUAL MB
A1 (E, EB, EF, EH)	RQT0012G	INSTRUCTION MANUAL MB
A1 (EI)	RQT0012V	INSTRUCTION MANUAL MB
A2 ⚠ (E, EH, EB, EF) (EI, EG)	SJA187	POWER CORD
A2 ⚠ (EK)	SJA193	POWER CORD
A3	SJP2249-3	OUTPUT CORD
A4	XZB23X35C03	PROTECTION BAG
A5	XZB26X17C03	PROTECTION BAG(CORDS)
A6	RQCA0002	CAUTION MB
A7	RMR0024	STOPPER MB
A8	UM-4NE/2S	BATTERY

■ RESISTORS AND CAPACITORS

Notes : * Important safety notice :
Components identified by ⚠ mark have special characteristics important for safety. When replacing any of these components use only manufacturer's specified parts.
* Bracketed indications in Ref. No. columns specify the area. (Refer to the first page for area.)
Parts without these indications can be used for all areas.

Numbering System For Resistors

Example:

ERD	25	F	J	102
Type	Wattage (1/4W)	Shape	Tolerance	Value (1KΩ)
ERX	2	AN	J	471
Type	Wattage (2W)	Shape	Tolerance	Value (470Ω)

Numbering System For Capacitors

Example:

ECKD	1H	102	Z	F
Type	Voltage (50V)	Value (0.001μF)	Tolerance	Unique
ECEA	50	M		330
Type	Voltage (50V)	Characteristics		Value (33μF)

● Capacity values are in microfarads (μF) unless specified otherwise, P = Pico-farads (pF) F = Farads (F).
● Resistance values are in ohms (Ω), unless specified otherwise, 1K = 1,000Ω, 1M = 1,000kΩ

Resistor Type	Wattage		Tolerance
ERD : Carbon	10 : 1/8W	12 : 1/2W	J : ±5%
ERG : Metal Oxide	14 : 1/4W	25 : 1/4W	F : ±1%
ERQ : Fuse Type Metal	1A : 1W	18 : 1/8W	G : ±2%
ERX : Metal Film	S2 : 1/4W	S1 : 1/2W	J : ±5%
ERD L : Carbon (chip)	2F : 1/4W	50 : 1/2W	K : ±10%
ERO K : Metal Film (chip)	2A : 2W	3A : 3W	M : ±20%
ERC : Solid	6G : 1/10W	8G : 1/8W	
ERF : Incombustible Box-Shaped			
ERM : Wire-Wound			
RRJ : Chip Resistor			
ERJ : Chip Resistor			

Capacitor Type	Voltage		Tolerance
ECE : Electrolytic	0J : 6.3V	1A : 10V	K : ±10%
ECCD : Ceramic	1C : 16V	1E : 25V	M : ±20%
ECKD : Ceramic Capacitor	1H : 50V	1V : 35V	Z : +80 −20 %
ECQM : Polyester	50 : 50V	05 : 50V	J : ±5%
ECQP : Polypropylene	2H : 500V	2A : 100V	G : ±2%
ECG : Ceramic	1 : 100V	1J : 63V	F : ±1%
ECEA N : Non Polar Electrolytic	KC : 400V AC		C : ±0.25pF
QCU : Ceramic (Chip Type)	KC : 125V AC (UL)		D : ±0.5pF
ECUX : Ceramic (Chip Type)			
ECF : Semiconductor			
EECW : Liquid electrolyte double layer capacitor			

Ref. No.	Part No.	Value.
RESISTORS(VALUE,WATTAGE)		
R11	ERDS2TJ331	330 1/4
R12	ERDS2TJ101	100 1/4
R13	ERDS2TJ103	10K 1/4
R14	ERDS2TJ103	10K 1/4
R15	ERDS2TJ101	100 1/4
R16	ERDS2TJ103	10K 1/4
R17	ERDS2TJ103	10K 1/4
R18	ERDS2TJ471	470 1/4
R19	ERDS2TJ331	330 1/4
R20	ERDS2TJ101	100 1/4
R21	ERDS2TJ103	10K 1/4
R22	ERDS2TJ103	10K 1/4
R23	ERDS2TJ102	1K 1/4
R51	ERDS2TJ102	1K 1/4
R52	ERDS2TJ393	39K 1/4
R53	ERDS2TJ153	15K 1/4
R54	ERDS2TJ101	100 1/4
R55	ERDS2TJ472	4.7K 1/4
R301	ERDS2TJ182	1.8K 1/4
R311	ERDS2TJ822	8.2K 1/4
R312	ERDS2TJ331	330 1/4
R351	ERDS2TJ103	10K 1/4
R352	ERDS2TJ104	100K 1/4
R353	ERDS2TJ123	12K 1/4
R354	ERDS2TJ104	100K 1/4
R355	ERDS2TJ333	33K 1/4
R356	ERDS2TJ333	33K 1/4
R357 ⚠	ERD25FJ6R8	6.8 1/4
R358	ERDS2TJ101	100 1/4
R359	ERDS2TJ101	100 1/4
R408	ERDS2TJ472	4.7K 1/4
R409	ERDS2TJ472	4.7K 1/4
R410	ERDS2TJ472	4.7K 1/4
R411	ERDS2TJ472	4.7K 1/4
R412	ERDS2TJ472	4.7K 1/4
R413	ERDS2TJ472	4.7K 1/4
R414	ERDS2TJ472	4.7K 1/4
R415	ERDS2TJ472	4.7K 1/4
R416	ERDS2TJ472	4.7K 1/4
R417	ERDS2TJ472	4.7K 1/4
R418	ERDS2TJ472	4.7K 1/4
R419	ERDS2TJ472	4.7K 1/4
R420	ERDS2TJ472	4.7K 1/4
R421	ERDS2TJ104	100K 1/4
R422	ERDS2TJ472	4.7K 1/4
R431	ERDS2TJ473	47K 1/4
R432	ERDS2TJ473	47K 1/4
R433	ERDS2TJ913T	91K 1/4
R434	ERDS2TJ104	100K 1/4
R435	ERDS2TJ913T	91K 1/4
R436	ERDS2TJ104	100K 1/4
R437	ERDS2TJ101	100 1/4
R451	ERDS2TJ104	100K 1/4
R452	ERDS2TJ103	10K 1/4
R501	ERDS2TJ224	220K 1/4
R502	ERDS2TJ562	5.6K 1/4
R503	ERDS2TJ474	470K 1/4
R504	ERDS2TJ101	100 1/4
R506	ERDS2TJ333	33K 1/4
R507	ERDS2TJ102	1K 1/4
R601	ERDS2TJ472	4.7K 1/4
R602	ERDS2TJ472	4.7K 1/4
R603	ERDS2TJ472	4.7K 1/4
R604	ERDS2TJ472	4.7K 1/4
R605	ERDS2TJ472	4.7K 1/4
R606	ERDS2TJ472	4.7K 1/4
R607	ERDS2TJ105	1M 1/4
R608	ERDS2TJ8R2	8.2 1/4
R801	ERDS2TJ103	10K 1/4
R802	ERDS2TJ103	10K 1/4
R803	ERDS2TJ103	10K 1/4
R804	ERDS2TJ103	10K 1/4
R805	ERDS2TJ273	27K 1/4
R806	ERDS2TJ273	27K 1/4
R807	ERDS2TJ273	27K 1/4
R808	ERDS2TJ273	27K 1/4
R809	ERDS2TJ473	47K 1/4
R810	ERDS2TJ473	47K 1/4
R811	ERDS2TJ473	47K 1/4
R812	ERDS2TJ473	47K 1/4
R813	ERDS2TJ221	220 1/4
R814	ERDS2TJ221	220 1/4
R815	ERDS2TJ474	470K 1/4
R816	ERDS2TJ474	470K 1/4
R817	ERDS2TJ104	100K 1/4
R818	ERDS2TJ104	100K 1/4
R819	ERDS2TJ471	470 1/4
R820	ERDS2TJ471	470 1/4
R821	ERDS2TJ473	47K 1/4
R822	ERDS2TJ473	47K 1/4
R823	ERDS2TJ331	330 1/4
R824	ERDS2TJ331	330 1/4
R825	ERDS2TJ102	1K 1/4
R826	ERDS2TJ102	1K 1/4
R831	ERDS2TJ331	330 1/4
R832	ERDS2TJ331	330 1/4
R833	ERDS2TJ472	4.7K 1/4
R834	ERDS2TJ561	560 1/4
R835	ERDS2TJ472	4.7K 1/4
R836	ERDS2TJ472	4.7K 1/4
R837	ERDS2TJ100	10 1/4
R838	ERDS2TJ100	10 1/4
R839	ERDS2TJ182	1.8K 1/4
R840	ERDS2TJ101	100 1/4
R851	ERDS2TJ102	1K 1/4
R852	ERDS2TJ471	470 1/4
R853	ERDS2TJ102	1K 1/4
R854	ERDS2TJ472	4.7K 1/4
R855	ERDS2TJ183	18K 1/4
R856	ERDS2TJ333	33K 1/4
R857	ERDS2TJ102	1K 1/4
R858	ERDS2TJ102	1K 1/4
R859	ERDS2TJ105	1M 1/4
R860	ERDS2TJ105	1M 1/4
R861	ERDS2TJ472	4.7K 1/4
R871	ERDS2TJ103	10K 1/4
R872	ERDS2TJ103	10K 1/4
R873	ERDS2TJ123	12K 1/4
R874	ERDS2TJ123	12K 1/4
R875	ERDS2TJ104	100K 1/4
R876	ERDS2TJ104	100K 1/4
R885	ERDS2TJ222	2.2K 1/4
R886	ERDS2TJ222	2.2K 1/4
R887	ERDS2TJ680	68 1/4

D

Ref. No.	Part No.	Value.
R888	ERDS2TJ680	68 1/4
R889	ERDS2TJ470	47 1/4
R890	ERDS2TJ470	47 1/4
R891	ERDS2TJ102	1K 1/4
R892	ERDS2TJ102	1K 1/4
R893	ERDS2TJ104	100K 1/4
R894	ERDS2TJ104	100K 1/4
CAPACITORS(VALUE,VOLTAGE)		
C1 ⚠	ECKDKC103PF2	0.01 125
C2 ⚠	ECFTD103KXL	0.01 25
C3 ⚠	ECFTD103KXL	0.01 25
C10	ECFR1E104ZF5	0.1 25
C11	ECEA1CU222	2200 16
C12	ECEA1CU222	2200 16
C13	ECFR1E104ZF5	0.1 25
C14	ECEA0JK470	47 6.3
C15	ECEA0JK470	47 6.3
C16	ECEA1AK101	100 10
C17	ECEA1AK101	100 10
C18	ECEA1CU221	220 16
C19	ECEA1CU331	330 16
C20	ECEA1CU331	330 16
C21	ECEA1VU101	100 35
C22	ECEA1VU101	100 35
C51	ECEA1HKN010B	1 50
C301	ECBT1C103NS5	0.01 16
C302	ECBT1C103NS5	0.01 16
C303	ECFR1E104ZF5	0.1 25
C304	ECFR1E104ZF5	0.1 25
C306	ECBT1H270J5	27P 50
C351	ECBT1H102KB5	0.001 50
C352	ECBT1H102KB5	0.001 50
C353	ECBT1H102KB5	0.001 50
C401	ECFR1E104ZF5	0.1 25
C402	ECEA0JK470	47 6.3

Ref. No.	Part No.	Value.
C403	ECFR1E104ZF5	0.1 25
C404	ECFR1E104ZF5	0.1 25
C405	ECFR1E104ZF5	0.1 25
C406	ECBT1H102KB5	0.001 50
C407	ECBT1H102KB5	0.001 50
C451	ECFR1E104ZF5	0.1 25
C452	ECEA0JK470	47 6.3
C453	ECFR1H223KD	0.022 50
C501	ECQM1H104KF	0.1 50
C502	ECFR1E104ZF5	0.1 25
C503	ECEA1CKS100	10 16
C504	ECFR1E104ZF5	0.1 25
C505	ECFR1E104ZF5	0.1 25
C506	ECBT1H150JC	15P 50
C507	ECBT1H102KB5	0.001 50
C508	ECEA1CKN100B	10 16
C509	ECBT1H470J5	47P 50
C510	ECQM1H104KF	0.1 50
C511	ECEA1HKR47	0.47 50
C512	ECBA1H681KB5	680P 50
C513	ECBA1H681KB5	680P 50
C514	ECQV1H474JZ3	0.47 50
C515	ECQM1H153KF	0.015 50
C516	ECEA1VSN2R2I	2.2 35
C518	ECBT1H561KB5	560P 50
C601	ECEA0JK470	47 6.3
C602	ECFR1E104ZF5	0.1 25
C603	ECFR1E104ZF5	0.1 25
C801	ECBT1H680J5	68P 50
C802	ECBT1H680J5	68P 50
C803	ECBT1H680J5	68P 50
C804	ECBT1H680J5	68P 50
C805	ECBT1H470J5	47P 50
C806	ECBT1H470J5	47P 50
C807	ECBT1H470J5	47P 50
C808	ECBT1H470J5	47P 50

Ref. No.	Part No.	Value.
C809	ECEA1EKN3R3B	3.3 25
C810	ECEA1EKN3R3B	3.3 25
C811	ECBT1H102KB5	0.001 50
C812	ECBT1H102KB5	0.001 50
C813	ECEA1CKN220	22 16
C814	ECEA1CKN220	22 16
C815	ECBT1H102KB5	0.001 50
C816	ECBT1H102KB5	0.001 50
C831	ECFR1E104ZF5	0.1 25
C832	ECEA0JS331	330 6.3
C833	ECFR1E104ZF5	0.1 25
C834	ECEA0JS331	330 6.3
C835	ECFR1E104ZF5	0.1 25
C836	ECFR1E104ZF5	0.1 25
C837	ECFR1E104ZF5	0.1 25
C838	ECBT1H5R6K5	5.6P 50
C840	ECBT1H5R6K5	5.6P 50
C841	ECEA0JK101	100 6.3
C842	ECFR1E104ZF5	0.1 25
C843	ECFR1E104ZF5	0.1 25
C844	ECBT1H270J5	27P 50
C845	ECFR1E104ZF5	0.1 25
C851	ECEA0JU471	470 6.3
C852	ECEA1CKN100B	10 16
C871	ECEA1EKN3R3B	3.3 25
C872	ECEA1EKN3R3B	3.3 25
C873	ECQM1H103KF	0.01 50
C874	ECQM1H103KF	0.01 50
C875	ECBT1C103NS5	0.01 16
C876	ECBT1C103NS5	0.01 16
C878	ECBT1C103NS5	0.01 16
C879	ECBT1C103NS5	0.01 16
C881	ECEA1CN101SE	100 16
C882	ECEA1CN101SE	100 16
C891	ECEA1AK101	100 10
C892	ECEA1AK101	100 10
C893	ECEA1CKN220	22 16
C894	ECEA1CKN220	22 16

Ref. No.	Part No.	Value.	
RESISTORS			
R3501	4822 111 52426	4K7 1/2	MB
R3502	4822 111 90214	100K 1/8	MB
R3503	4822 111 30499	4E7 1/3	MB
R3504	4822 111 30499	4E7 1/3	MB
R3505	4822 111 90253	12K 1/8	MB
R3506	5322 111 90091	100 1/8	MB
R3507	4822 111 90248	2K2 1/8	MB
R3508	4822 111 90512	24K 1/8	MB
R3509	4822 111 90572	5K6 1/8	MB
R3510	4822 111 90249	10K 1/8	MB
R3521	4822 111 90178	220 1/8	MB
R3522	4822 111 30515	18 1/3	MB
R3523	4822 111 30511	12 1/3	MB
R3524	5322 111 90091	100 1/8	MB
R3530	4822 111 90543	47K 1/8	MB
R3531	4822 111 90344	15K 1/8	MB
R3533	5322 111 90268	5K1 1/8	MB
R3534	4822 111 90197	220K 1/8	MB
R3535	4822 116 53081	12K 3/5	MB
R3540	4822 116 52858	4E7 3/5	MB
R3541	4822 111 90544	6K8 1/8	MB
R3542	4822 111 90124	82 1/8	MB
R3543	4822 111 90544	6K8 1/8	MB
R3544	4822 111 30483	1 1/3	MB
R3545	4822 111 30483	1 1/3	MB
R3550	4822 111 90248	2K2 1/8	MB
R3551	4822 116 90417	15K 1/8	MB

Ref. No.	Part No.	Value.	
R3552	4822 111 90171	820 1/8	MB
R3554	4822 116 90421	2K 1/8	MB
R3555	4822 111 90251	22K 1/8	MB
R3560	4822 111 91494	11K 1/8	MB
R3561	4822 116 90417	150K 1/8	MB
R3562	4822 116 52845	120K 3/5	MB
R3563	4822 111 90573	56K 1/8	MB
R3564	4822 111 91495	160K 1/8	MB
R3565	4822 116 52354	27 1/2	MB
R3566	4822 111 90186	22 1/8	MB
R3567	4822 116 52478	82K 1/2	MB
R3568	4822 111 90161	470K 1/8	MB
R3801	4822 111 90163	0E	MB
R3802	4822 111 90163	0E	MB
CAPACITORS			
C2501	4822 122 33147	0.022 50	MB
C2502	4822 124 22027	47 10	MB
C2503	4822 122 33147	0.022 50	MB
C2504	4822 122 31727	470P 63	MB
C2505	4822 124 22027	47 25	MB
C2506	4822 122 33104	100NF 63	MB
C2507	4822 122 31644	0.0022 63	MB
C2508	5322 121 42491	0.047 100	MB
C2509	4822 122 31772	47P 50	MB
C2510	4822 122 32442	0.01 50	MB
C2511	4822 122 31746	0.001 50	MB
C2513	4822 121 42245	0.22 63	MB

Ref. No.	Part No.	Value.	
C2514	4822 121 51252	0.47 100	MB
C2515	4822 122 31746	0.001 5	MB
C2520	4822 122 31965	220P 6	MB
C2521	4822 124 22027	47 25	MB
C2530	4822 121 51321	0.0082 6	MB
C2531	4822 121 51321	0.0082 6	MB
C2532	4822 124 40272	33 1	MB
C2534	5322 121 42661	0.33 6	MB
C2535	5322 122 31848	0.033 6	MB
C2536	5322 122 31848	0.033 6	MB
C2537	4822 121 42245	0.22 6	MB
C2538	4822 121 42245	0.22 6	MB
C2540	4822 124 41583	0.68 5	MB
C2541	4822 122 33147	0.022 5	MB
C2542	4822 122 33147	0.022 5	MB
C2543	4822 124 40196	220 1	MB
C2544	4822 124 40196	220µ 1	MB
C2545	4822 122 33104	0.1 6	MB
C2546	4822 122 33104	0.1 6	MB
C2547	4822 122 33147	0.022 5	MB
C2550	4822 121 51049	0.015 6	MB
C2551	4822 121 51225	18NF 6	MB
C2560	4822 122 31784	0.0047 5	MB
C2561	4822 121 51252	0.047 10	MB
C2562	5322 121 42661	0.033 6	MB
C2563	4822 122 33104	100NF 6	MB
C2565	4822 122 32808	0.0012 5	MB

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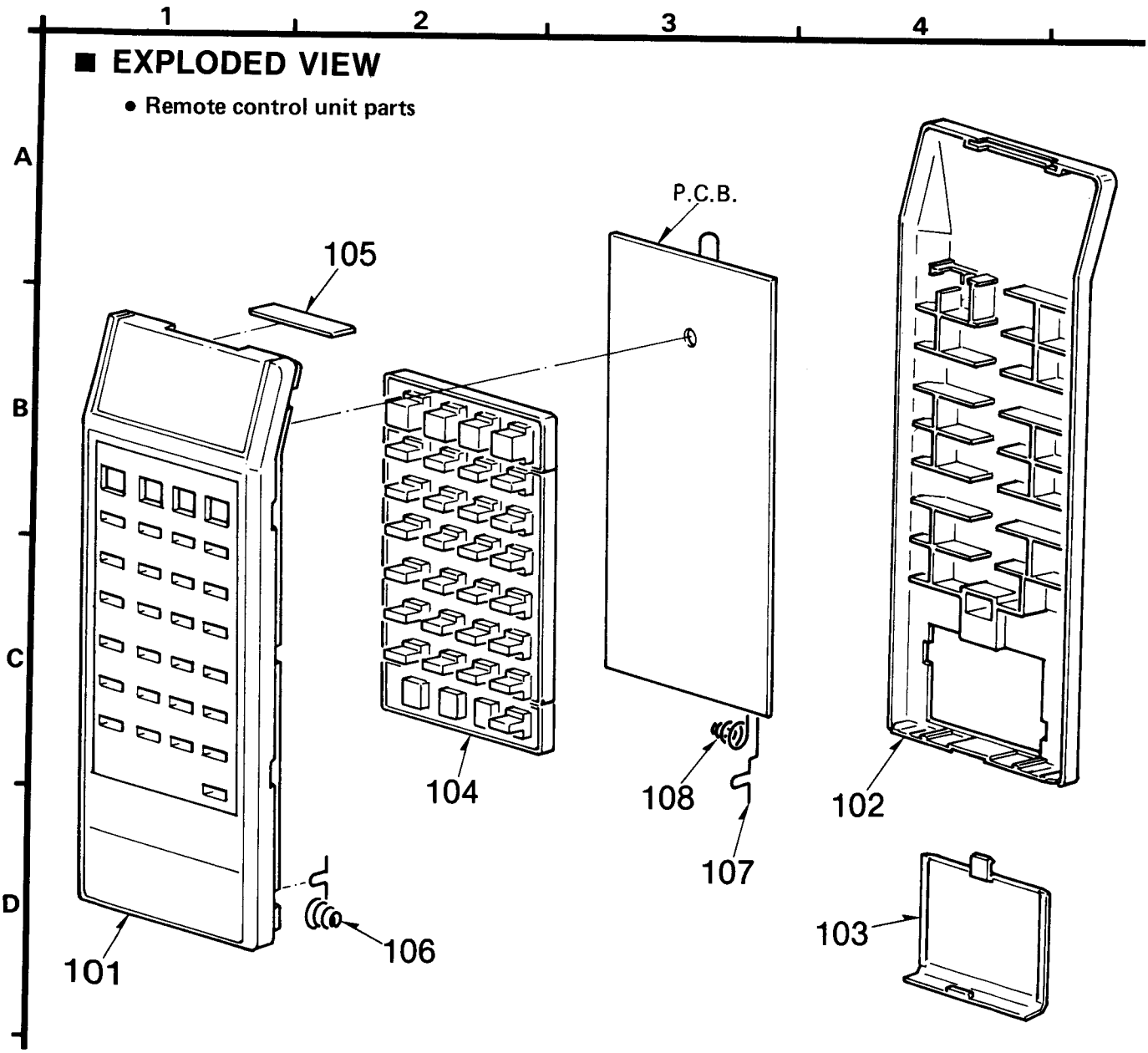
■ REPLACEMENT PARTS LIST

Ref. No.	Part No.	Description
REMOTE CONTROL		
INTEGRATED CIRCUITS		
IC1	MN6014HS	I.C
TRANSISTORS		
Q1	2SC3265Y	TRANSISTOR
DIODES		
D1	LN66-S	L.E.D
OSCILLATOR		
X1	CSB420PB6	OSCILLATOR
RESISTORS		
R1	ERD25TLJ1R0U	RESISTOR
CAPACITORS		
C1	ECUV1H471KCG	CAPACITOR

Ref. No.		Part No.	Description
C2		ECUV1H471KCG	CAPACITOR
C3		ECEA0GK101	ELECTROLYTIC, 100μF, 4V
MECHANISM PARTS			
101	Ⓚ	UR64VCS710	UPPER CABINET
101	Ⓢ	UR64VCS712	UPPER CABINET
102	Ⓚ	UR64CS803A	LOWER CABINET
102	Ⓢ	UR64CS803B	LOWER CABINET
103	Ⓚ	UR64EC804	BATTERY COVER
103	Ⓢ	UR64EC804A	BATTERY COVER
104		UR64CT805K	BUTTON
105		UR52SB327	PLATE(SMOKE)
106		UR64TD374	BATTERY TERMINAL(COMMON)
107		UR64TD808	TERMINAL (+)
108		UR64TD809	TERMINAL (-)
REMOTE CONTROL ASS'Y			
RC1	Ⓚ	EUR64766	REMOTE CONTROL
RC1	Ⓢ	EUR64767	REMOTE CONTROL

■ EXPLODED VIEW

• Remote control unit parts



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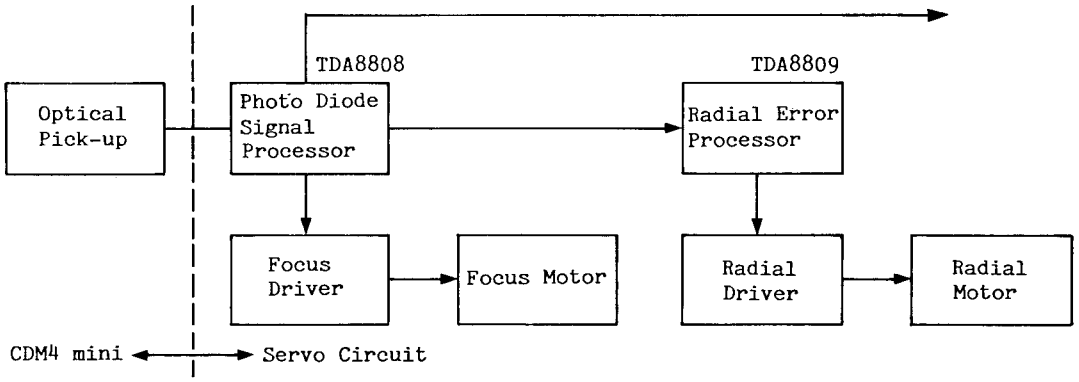
■ TECHNICAL INFORMATION

Explanation on the CDM4 mini system and servo circuit for service engineers

1.System Configuration

1-1.Block Diagram Rough



* Refer to the page 18 and 19.

2.Rough Explanation of the Functions of the CDM4 mini System Part.

2-1.Servo electronics CDM4 mini system.

TDA8808: bipolar photo diode signal processor

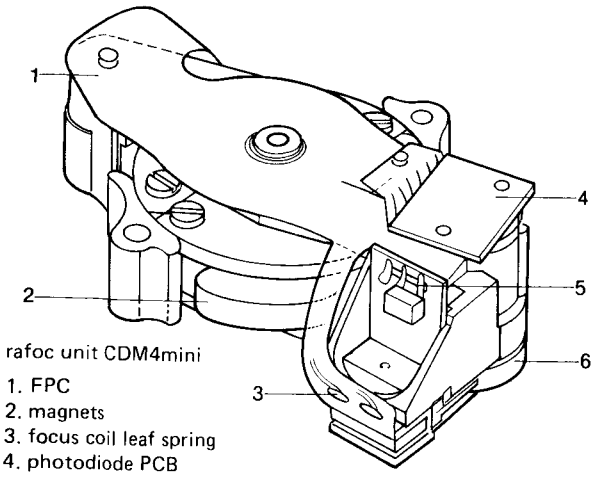
- Photodiode signal preamplifiers with separate h.f. and d.c. a.g.c. for optimum generation of the h.f. data signal and the focusing/tracking error signals.
- Tracking error signal amplifier.
- Focus error signal processor with focus normalizing and start-up circuit.
- Data equalizer.

  h.f. level and track-loss detectors.
- Regulated supply for the reading laser diode.
- Low current consumption: 15mA (8V -14V).

TDA8809: bipolar radial error processor

- Tracking error processor with automatic asymmetry control.
- a.g.c. circuitry with automatic start-up wobble generator.
- Tracking control for fast forward/reverse scan, search, repeat and pause functions.
- Low current consumption: 10mA (8V - 14V).

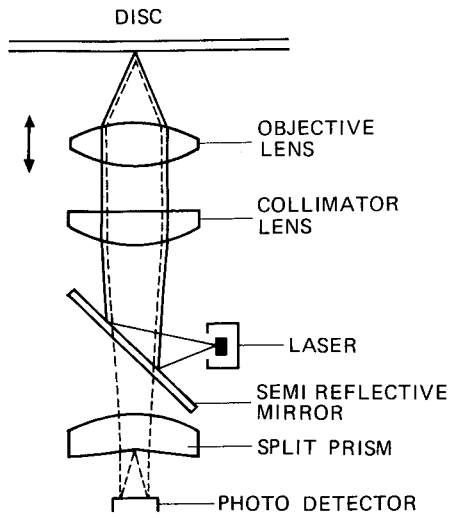
2-2.CDM4 mini Optical Pick-up



rafoc unit CDM4mini

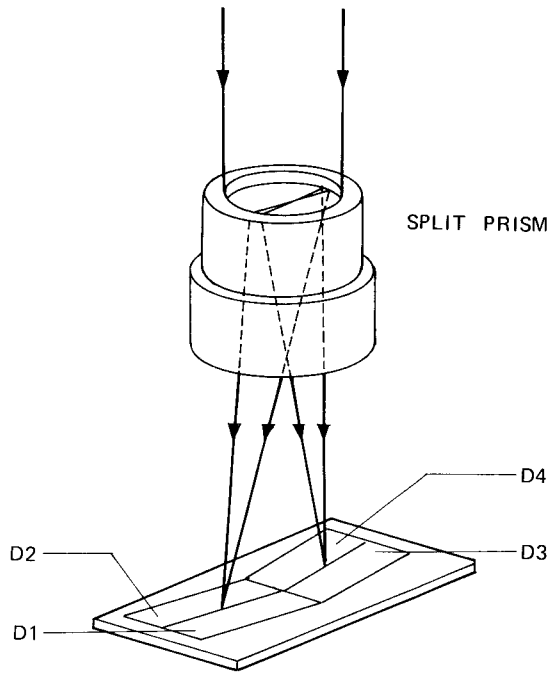
1. FPC
2. magnets
3. focus coil leaf spring
4. photodiode PCB
5. LASER protection PCB
6. focus unit

A feature of the CDM4 mini pick-up is its simple diffraction limited optics. The laser point source is focused on the information layer of the disc by two lenses: a spherical glass objective with a plastic aspherical skin, and a spherical glass collimator.



CDM4 Mini

Furthermore, a semi-transparent mirror is used instead of a beam-splitter cube. Astigmatism introduced into the reflected beam by the mirror is corrected by a plastic component (the wedge) which also dissects the beam into the two halves from which the tracking and focus error signals are generated.

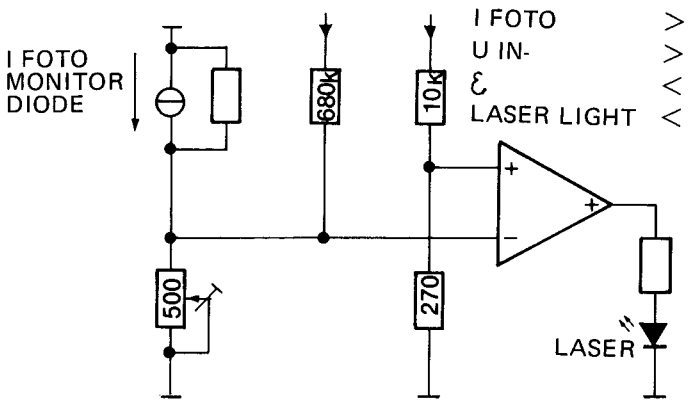


DETAIL OF LASER BEAM

3.Detailled Explanation of the Functions in the Servo.

3-1-1 The LASER supply

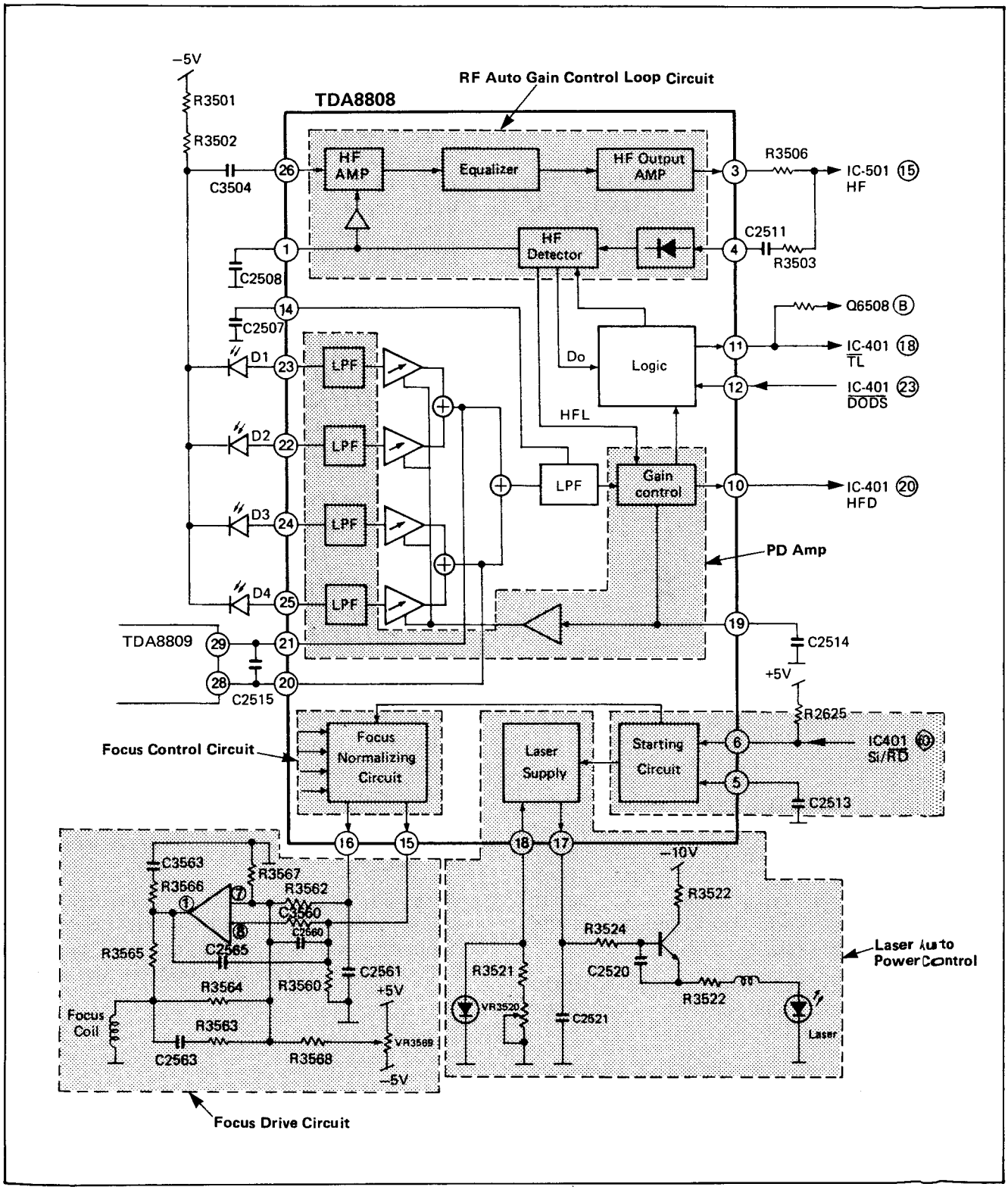
The LASER supply circuit has a working principle like the basic schematic below.



The LASER supply function integrated in the TDA8808 has as an extra an overload protection and a turn on transient protection. The LASER current is regulated by sensing the monitor photodiode current.

The threshold voltage of the LASER diode is approximately 1.75V and the sense voltage is approx. 200mV. It is not allowed to measure the sense voltage. A distortion at this end of the loop might cause severe damage to the LASER diode.

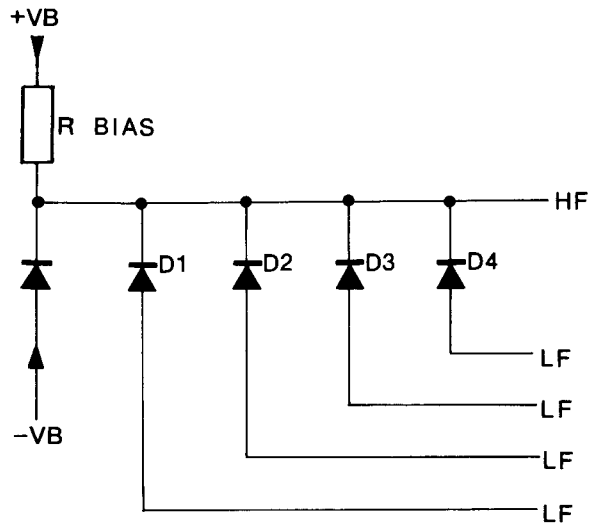
3-1-2 h.f. Signal handling, h.f. a.g.c.
and data qeualizer.



D

The photodiodes used in the optical pick-up are connected in reverse direction. The photodiodes require a reverse bias of at least 5V. Bias current is set by R3501 and R3502. Supply noise and interference is kept away by R3501 and C2521. Coupling of the h.f. signal is performed by C2504, R3502 and C2521 also prevent h.f. coming into the supply.

The h.f. signal is effectively separated; from the I.f. signals by deriving the h.f. signal from the total substrate current of the four photodiodes and only the I.f. error signals from the individual anode currents.(see figure below).



The h.f. signal is effectively separated; from the I.f. signals by deriving the h.f. signal from the total substrate current of the four photodiodes and only the I.f. error signals from the individual anode currents. (see figure below).

The h.f. amplifier and a.g.c. circuit have to meet the correct transfer function.

The parameters of the transfer function are set by R3505, R3508, R3507, C2509, and C2508.

With internal girators the qeualizer provides a 3rd order bessel filter for making the correct modular transfer function to compensate the optical pick-up system. The total IC bias current is set by the value of R3508 and decoupled by C2510. The girator circuits are set by the value of R3505.

The 3rd pole of the modular transfer function is made by the RC circuit containing R3507, C2511 and the capacitance of the h.f. wire from the CDM to the demodulator circuits.

3-1-3 The amplitued level detector

For the a.g.c. the amplitude of the h.f. signal is measured in a level detector by comparing a full-wave rectified and fitered version of the h.f. signal with an internal reference level. The level detector is not data path but parallel to the data path as in the CDM4 system. For fast response to drop-out the time constant of the high pass filter formed by R3507, C2511 and the detector input resistance has to be 10 sec. In the h.f. amplitude slicer the amplitude of the h.f. signal is sliced in 3 levels.

62% and below is HFD
12% and below is DO

The HFD output is used to switch the PLL on and off ensuring minimum locking loss while having a drop-out or during searching. This provides fast relocking afterwards.

Capacitor C2508 in combination with an internal switch provides a more constant gain control during drop-outs. The switch is operated by the HFD signal. This set-up restricts the h.f. signal and gives the loop a bandwidth of 50Hz.

When the pick-up is searching for a track the DODS (drop-out detection suppression) is activated to keep the h.f. signal level clamped on the normal

3-1-4 The photodiode current amplifiers and I.f. a.g.c.

The low pass filters for the photodiode inputs D1 - D4 are integrated in the photodiode signal processor.

The outputs for RE1 (RE1 = D1 + D2) and RE2 (RE2 = D3 + D4) are open collector outputs. In case an external pull-up has to be connected, it has to be connected to Vdd.

Normally the pull-up function is done by the inputs of the radial error processor.

The a.g.c. for the photodiode amplifiers keeps the d.c. sum current constant for all discs. The control loop has a LPF which is set by the value of C2507.

3-1-5 The track loss detector

During playback of a disc, the radial error signals keep the pick-up on track. In case of searching for a certain spot of music, the pick-up has to jump over the tracks. To maintain the control of the pick-up during a search operation, the microprocessor must be informed whether the pick-up is on track or off track. This function is performed by the track-loss detector.

Condition to be met for the track-loss:

- The gain controlled h.f. signal has to be between 12% and 62% of the nominal value (100% is set by the h.f. a.g.c.).
- Average light intensity of the I.f. signal is more than 120% of the nominal value (100% is set by the I.f.a.g.c.).

All values are set during track following.

Use of the TL signal:

1. Counting tracks when track jumping.
2. In case a TL is detected during normal playback the control microprocessor looks to the RE dig signal from the radial error processor and compensates the tracking error by means of the DAC signal.

Such a situation can only occur due to large knocks. This set up makes the system extremely tolerant for bumps.

(Formula TL=FS>120% and 63%>HFL>12%).

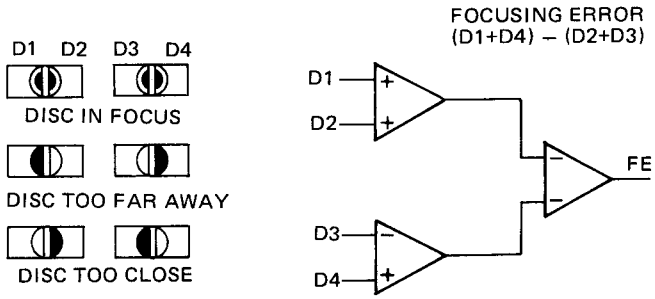
3-1-6 Focus processing

The CDM4 pick-up uses two focuault knife focus pick-ups to keep the reading spot focused on the data layer of the disc.

The TDA8808 has two focus outputs: FE and FE lag.

FE lag is the basic focus error signal. FE is a normalized version of FE to remove the effect of the unequal illumination of photodiode pairs D1, D2 and D3, D4 which occurs in case of tracking errors.

PRINCIPLE



FE lag= (I1 + I4)-(I2 + I3).Ftransfer

$$FE = \frac{I1 - I2}{I1 + I2} + \frac{I4 - I3}{I4 + I3} \quad \text{I control}$$

Since in focus I1 + I2 ≈ I3 + I4

and I1≈I2≈I3≈I4 with a.g.c. on

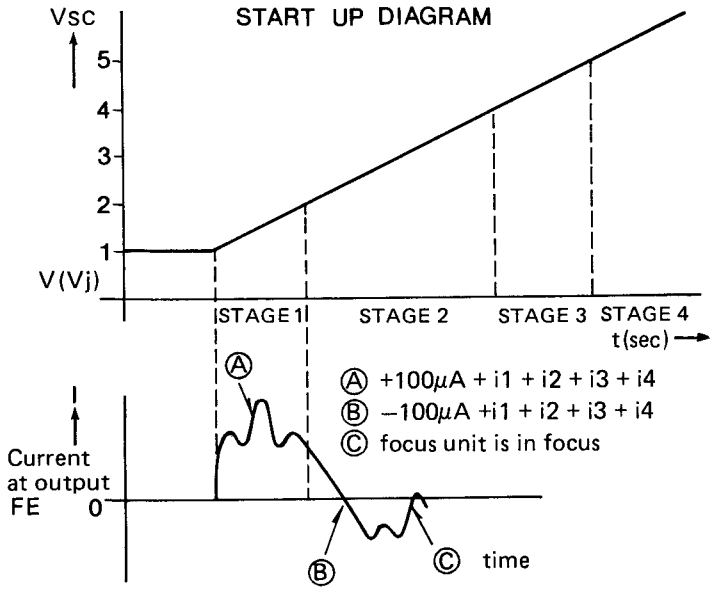
FE = FE lag on trace

Either one signal or both signals can be used to control the focus actuator. The FE lag signal gives the loop the correct gain and phase margin. The FE signal has an important role in the start-up procedure.

3-1-7 Start-up procedure

The whole start-up procedure is sequenced by the voltage across capacitor C2513. Capacitor C2513 is charged by an internal current source of 1 µA nom.
Together with a starting capacitor of 270 nF, a starting-up time of approximately 0.3 sec. is reached.

The start-up procedure is divided in stages. The procedure is started by putting a logical low level at the Si/$\overline{RD}$ input.



STAGE 1

Laser turns on and the objective is moved to the center of the disc. The turntable motor is switched on. The FE pin delivers a positive going starting current of 100 µA + the sum current (I1 + I2 + I3 + I4).

Note the I.f. a.g.c. does not see light, so max amplification.

STAGE 2

The starting current is reversed, gradually causing the objective to go down. This process is stopped when the starting current equals the amplified sum current (I1 + I2 + I3 + I4).

Note: I1 + I2 + I3 + I4 = 100µA

STAGE 3

A smooth transition is made from the amplified sum current (I1 + I2 + I3 + I4) to the normalized focus error signal

$$\frac{I1 - I2}{I1 + I2} + \frac{I4 - I3}{I4 + I3}$$

The spot is now almost focused on the reflective layer of the disc.

The signals to the FE pin.

STAGE 1 (starting-up current + I1 + I2 + I3 + I4)
STAGE 2 (starting-up current + I1 + I2 + I3 + I4)
Stage 3 $\frac{I1 - I2}{I1 + I2} + \frac{I4 - I3}{I4 + I3}$
This should be almost 0

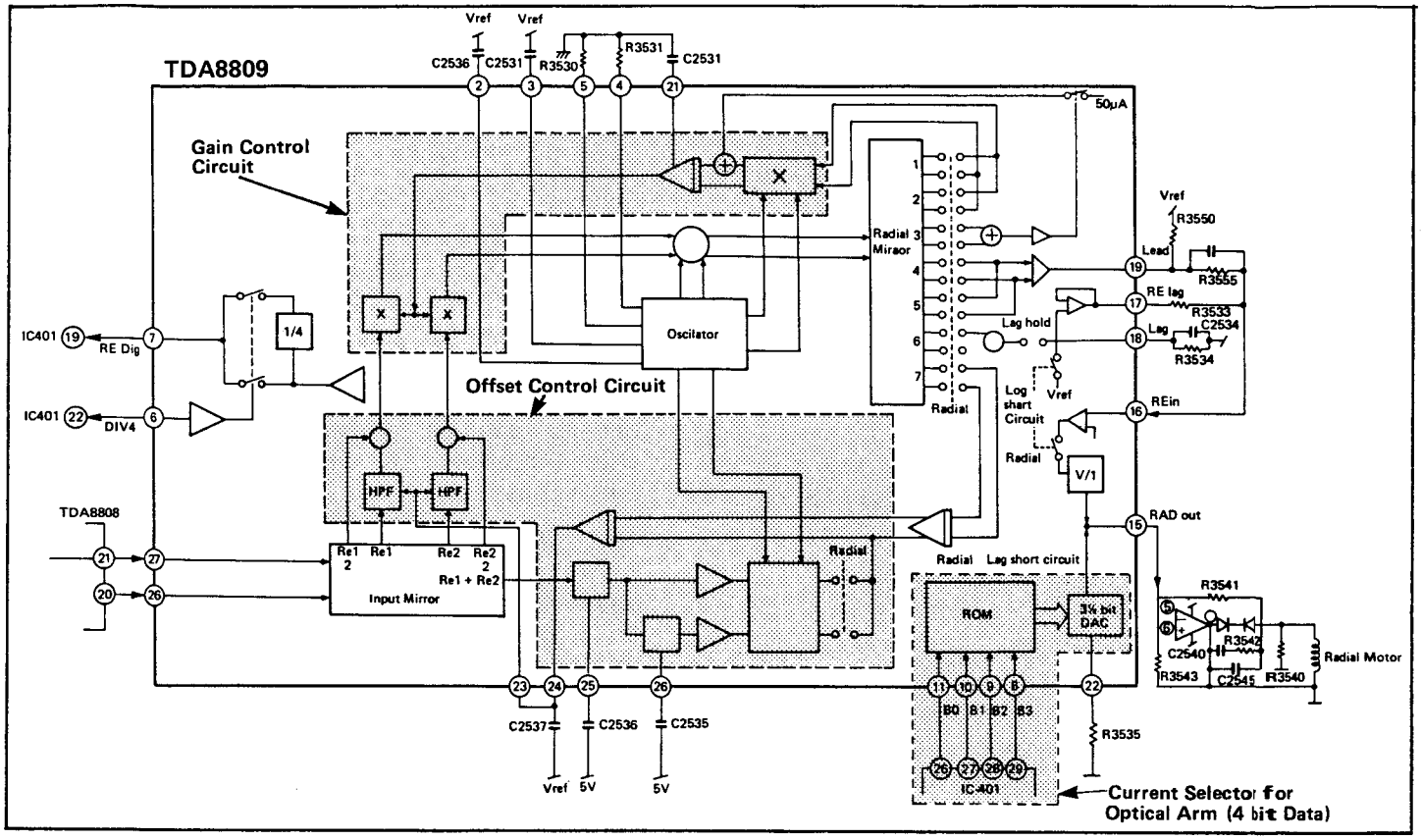
The signal to the FE lag pin.

Stage 4 (I1 + I4) - (I3 + I2) + the normalized FE (like in stage 3)

The arm is kept at the inside recess by means of a binary word from the microprocessor at B0, B1, B2, and B3 of the radial error processor.

D

3-2 TDA8809 RADIAL ERROR PROCESSOR

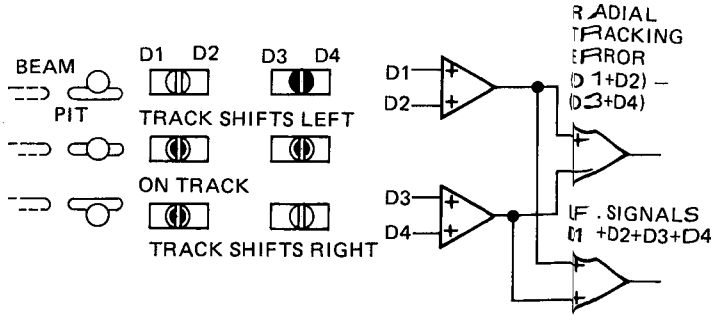


- The resistor R3535 sets the amount of output current of the DAC signal.
- The other components setting the oscillator frequency are R3530, R3531, C2530, C2531.
- The inputs B0 - B3 are used to control the operations which have to be performed by the radial error processor.
- The DAC output is a current source output used to move the radial arm. The normal control is RE, but to jump beyond tracks and to compensate bumps the DAC signal is used.
- The RE lag output gives the loop a more powerful control.
  This output is only activated during normal playback.
- The RE dig is a 1-bit quantized version of the RE signal. The function of RE dig is not in all sets the same. Below is the function in a audio player explained. If a TL occurs the microprocessor looks to RE dig, the value of RE dig indicates whether the microprocessor has to compensate for a right or left bump via DAC . The maximum hold range of RE is normally 1/4 track pitch due to the sinusoidal form of the radial error signal. By means of TL and RE dig the hold range is extended to 3/4 track pitch.
- For high speed track crossing, four dived RE dig signal is given by pulling Div 4 input to low level.

3-2-1 Radial processing

The radial error processor has to process the basic input signals RE1 and RE2 and to generate the full radial error signal RE. The RE signal is the basic signal to keep the reading beam on track.

RE1 and RE2 are caused by more or less light of the laser failing onto diodes D1, D2 or D3, D4 (see figure below)



RE1 = i1+i2 and RE2 = i3+i4

D

The processing formula produced by the radial error processor is RE = k d (i1+i2+i3+i4) - k(i1+i2).

The factors k and d are detected from the loop itself by processing a low frequency wobble fault signal, which is injected into the loop. Injection of this causes a displacement of +/- 0.05 µm of the arm.
The k is again factor and has to compensate:

- The tracking angle fault (varies between 90 degrees, smallest radius, and 45 degrees, largest radius).
- The pit geometry of disc (causing the amplitude of radial error signals to vary up to 100% from disc to disc).
- Deterioration of the laserdiode.

3-2-2 Automatic gain control (k-factor)

Detection of the desired value is done by detecting the phase angle of an injected wobble signal in the radial loop.

The closed loop transfer function has a phase shift of 135 degrees at 650 Hz (the wobble frequency).

To maintain the loop gain, the phase of the closed loop signal of RE is compared with a -45 degrees shifted signal derived from the 650 Hz wobble injection oscillator. If the gain is nominal the output of this phase comparator is zero. In other cases a positive or negative phase error signal is detected.

The detected signal is integrated by C2538. The value of this integrated signal sets the gain. This completes the set up for the k factor in TDA8809.

Note: The phase comparator is a linear multiplier which ensures that the a.g.c. loop is unaffected by spurious signals near the odd harmonics of the wobble frequency.

The open-loop gain control is clamped to an internal reference level during starting-up and searching.

3-2-3 Automatic asymmetry control (d-factor)

The radial error signal in a single-beam pick-up is derived from a comparison of the light intensity in each pupil half.

Errors in this signal can be caused by:

- Asymmetry in the far-field pattern of the laser.
- Light path to the disc.
- Imperfections in the beam splitter.

Errors can be corrected by bringing the d-factor in the total transfer function.

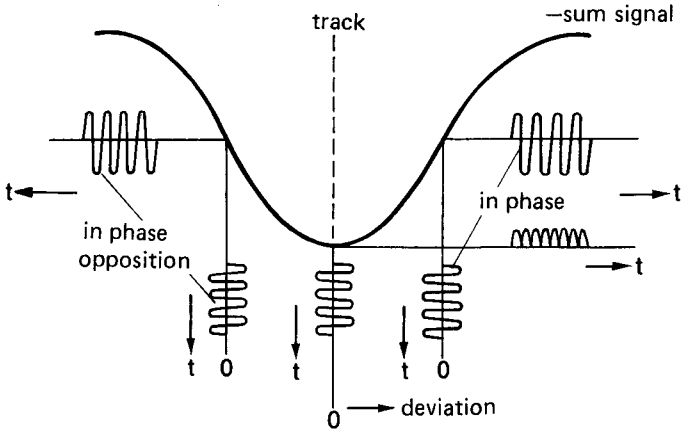
The wobble used to measure the k-factor is also used to measure the asymmetry. The signal causes the beam to wobble with an amplitude of 0.05 um. When the reading spot is to the right of the track the total amount of L.F.light (iTOT = i1+i2+i3+i4 = RE1 + RE2) is in phase with the wobble in the radial error signal.

When the reading spot is to the left the I.f. sum signal (RE1 + RE2) is 180 degrees out of phase with the wobble.

The sum signal is in practice multiplied by a 90 degrees shifted version of the wobble signal. The multiplier is again linear giving the above-mentioned benefits. The loop has a filter which is set by the value of C2537.

The imperfections mentioned above make the beam follow the track at one of its edges. The wobble component in the RE signal for such a situation is visualised below.

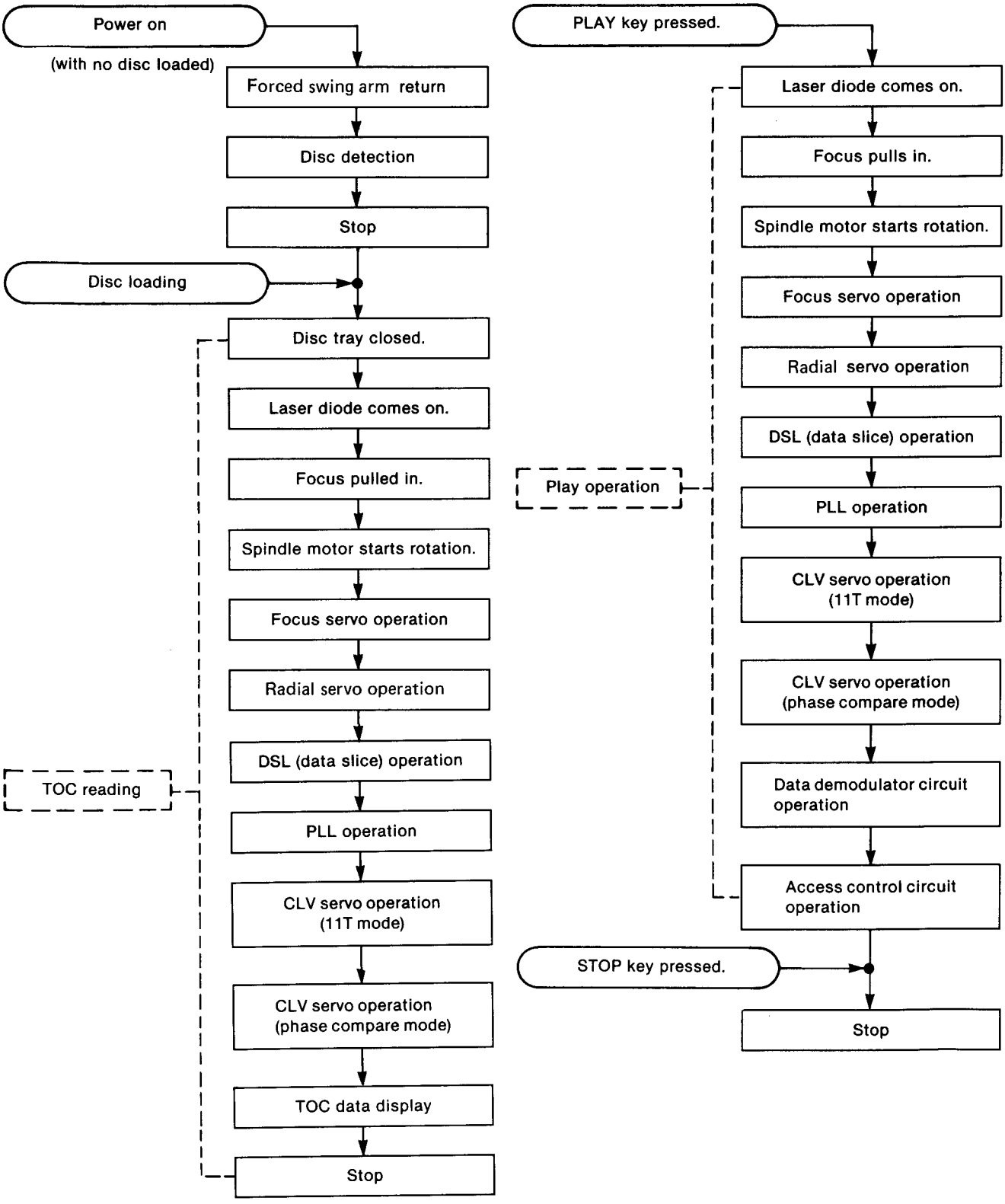
Note: C2537 is the capacitor which integrates the d-factor.



■ TROUBLESHOOTING GUIDE

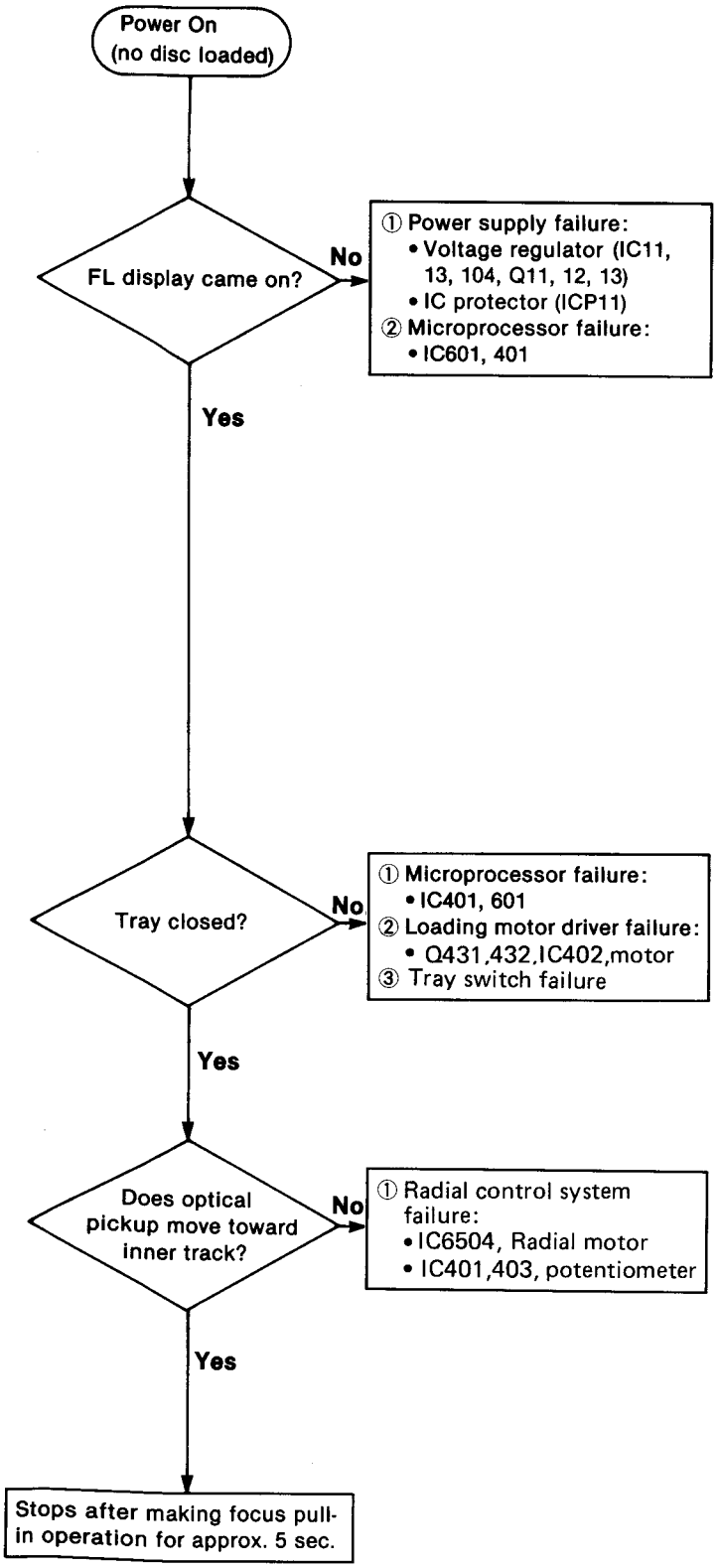
SL-P222A Operation Sequence Check Sheet

Play Operation Sequence

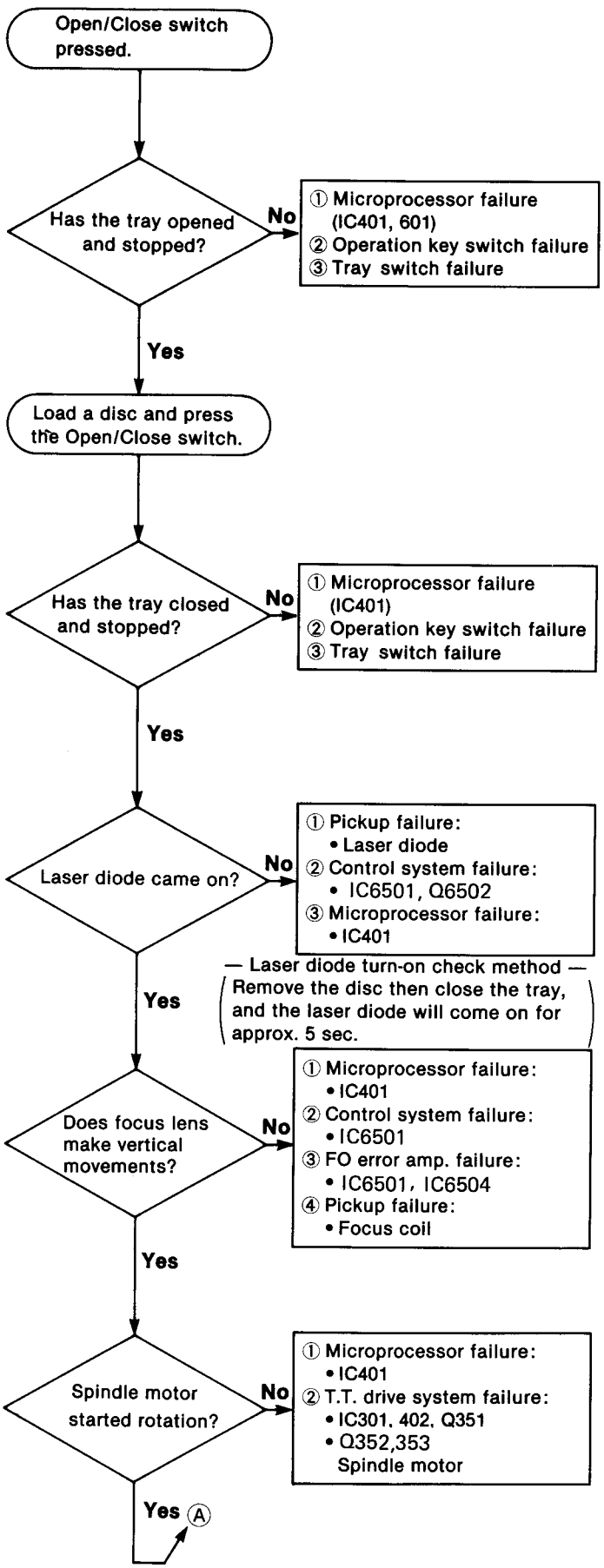


D

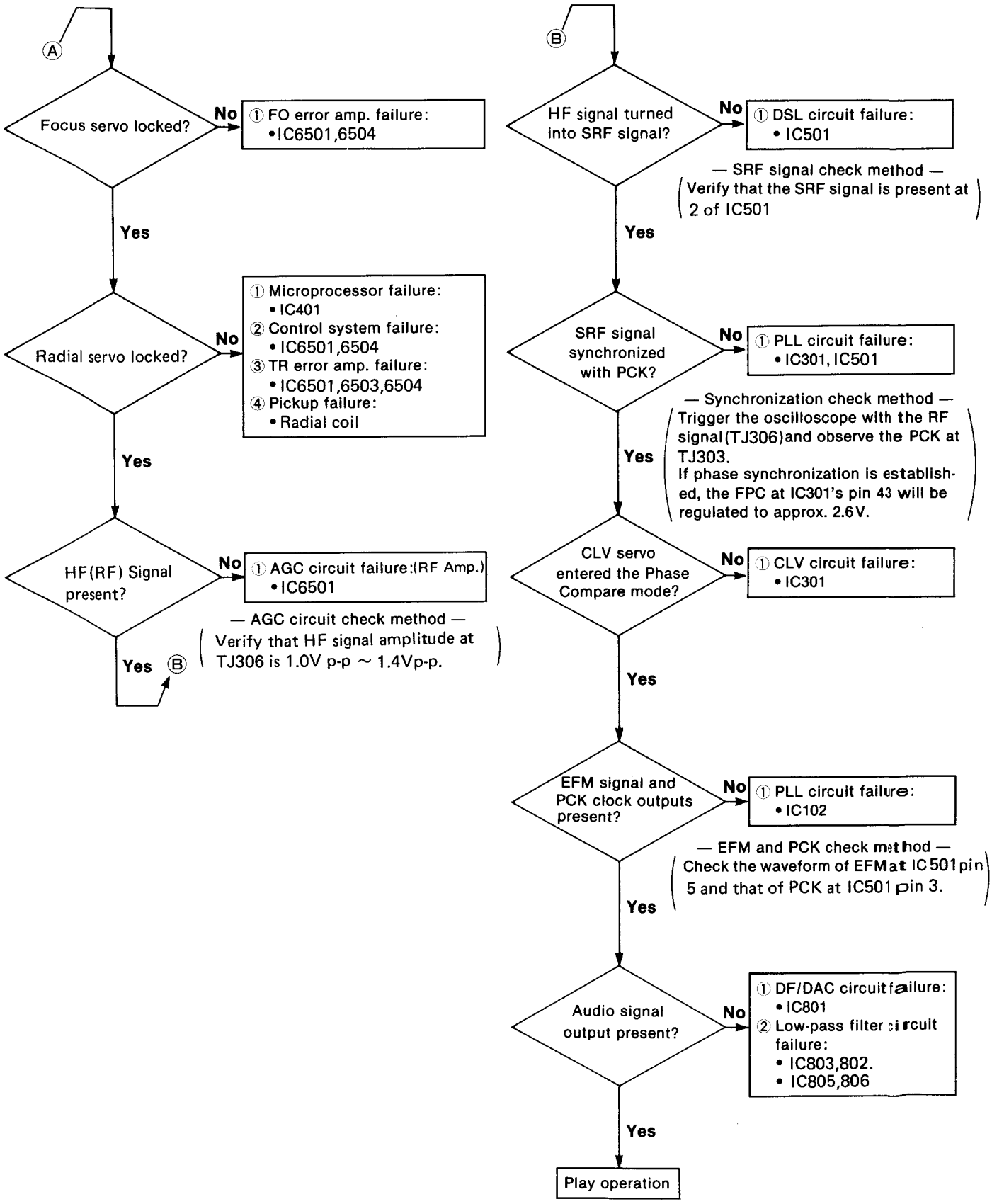
(Operation Sequence Just After Power On)



(TOC Read Operation-PLAY Operation)



D



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